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A Look at Short- and Long-Term Sales Forecasting

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Noting a trend towards use of long-term forecasting for periods which run largely beyond cyclical influences and the appearance of improved data for short-term forecasting, the author of the present article points up some of the considerations which make for value or hazard in employment of either type, interspersing the text with brief examples from the situation of individual companies and with general comments.

FORECASTING IS DONE by every business enterprise, large or small. In many cases, it may not even be recognized as forecasting. In other cases, the planning of future courses of action may be the specific and major responsibility of the top echelons of management. The delicatessen owner placing his order with a wagon-jobber is forecasting the demand of his trade for the ensuing short-term. However, he will not think of his act as forecasting. At the other extreme, continued growth and vigor of giant enterprises demand the most intelligent and expert forecasting to plan the facilities needed to meet the future needs of customers.

Turn Toward Long-Term Forecasting

In many respects, the objectives of long-term forecasting are different from those of short-term forecasts. It is my impression that American business has been placing relatively greater emphasis on long-term plans and projections during the past fifteen years. Since the end of World War II, short-term forecasting has grown more difficult and sometimes has been woefully inaccurate. Also, as the facts of population growth emerge and its implications of increased business activity ten and twenty years hence are appreciated, more and more enterprises

may be taking the long view and basing their planning on trends rather than on cyclical fluctuations.

The metal can industry represents an excellent example in this connection. Its trials and tribulations were much like those of any other industry when World War II engulfed us and cut off almost all our supply of tin. During the war, the production of cans was cut back sharply, even though the expansion of electrolytic tinplate facilities enabled the industry to stretch greatly its meager tin supplies. Restrictions were slowly removed after the end of the war, only to be re-imposed in a modified degree after the outbreak of hostilities in Korea. Nevertheless, the per capita consumption of tinplate in cans in this country increased from 24 to 51 pounds a year from 1929 to 1951, and is still growing lustily. Had the expansion of can manufacturing facilities been influenced to any significant degree by cyclical changes in business during that twenty-five year period, that industry might not have achieved its present position.

Considering Sales History, Share of the Market, Trends, Inflation

The analysis and interpretation of the sales history of a company must, for the most effective results, be related to pertinent external factors—and this does not mean just the sales history of the rest of the industry, even when such data is available. For example, the past sales of automobile replacement parts, such as tires, fan belts and radiator hose, do not yield their full meaning until they are correlated with auto and truck usage, as measured by gasoline consumption. The longer life which comes from improved quality in these parts can be evaluated and used to adjust any projections of future sales.

On the other hand, bottle crowns, no matter how excellent their quality or long their life, are entirely consumed when used to cap a bottle; and past sales should be related to the growth of the young segment of our population, rather than to the growth of the whole. In forecasting future trends, the competition of the flat-top can as a container for carbonated beverages must be integrated into any projection.

Again, for instance, the growing interest of Americans in weight-control certainly is a significant factor in forecasting the future sales of flour and sugar. On the other hand, the growing proportion of children in our population represents an increasing market for candy, soft drinks and cookies.

A company's share in the market for its product is a valuable statistic and any change up or down over the years has real significance. However, companies which can measure their performance in this respect are probably greatly outnumbered by those which are unable to obtain reliable industry sales figures or

account for only a small per cent of the total sales of their respective industries. Where industry statistics are available, they are most helpful merely to make sure that no competitor is making serious inroads on the company's volume. Otherwise, in my opinion, management attention should be devoted to maintaining product quality, an effective distribution organization, proper cost control and other aids to profitable operation.

In preparing a long-term (five to ten years) projection of sales, the choice of a trend-line is a vital matter, and the choice of a trend-line depends heavily on the stage of growth of the company. As demonstrated by scores of examples, any successful business may go through an introductory period which lasts for a number of years. At the end of this period, if its products have proved their value and if its sales efforts have been reasonably well-spread over major sections of the market, the business reaches a surge point where, under aggressive management, it can achieve a sharp rate of gain in sales. This rate of gain persists quite steadily, generally with little disturbance from general business conditions, for five years or longer, depending on the type of products.

At the end of this surge phase, the rate of growth tends to decline each year, even though dollar volume continues to increase; that is, a consistent increase in sales of a million dollars a year represents a declining rate of growth. As a net result, the growth curve begins to bend in toward an ultimate ceiling for the company's sales. This ceiling is commonly viewed as a limiting percentage of the market. As examples, the sales curves of packaged beer and room air-conditioners may be contrasted. In 1953 sales of the former were barely 5 per cent ahead of 1952. In the case of the latter, 1953 sales were far more than double those of 1952. Obviously, the forecast sales of the two products over the next five to ten years would represent two totally different trend lines.

In addition to the proper choice of a trend-line and proper orientation of current sales performance to that line, any changes in the price level must be given full effect. Many of the trend-lines being constructed today have a built-in inflation factor which is being projected into the future. Experts differ in their opinions as to how much inflation should be forecast for the future, but the important thing is to determine how much price increase is contained in the past sales history, so that the true trend of unit sales can be determined. Here too, the simple relationship between quantity and price cannot always be taken at face value. The gallon of gasoline which sold for ten cents off the tank-wagon in 1941 represented less basic value than the gallon that sells today for sixteen or seventeen cents. Therefore, in the case of many products, the construction of the trend-line should reflect the increase in value which may have accompanied an increase in price.

The Short-Term Forecasting Problem

In some of the statements made under the present subcaption, I have relied upon the text of James H. Lorie's paper, entitled "Prediction of Consumer Spending for Durable Goods and Houses" which was printed in the American Management Association's *Financial Management Series No. 102,* published in December 1952. The material so availed of relates to discernment of a number of factors in short-term forecasting and to the chronology of events cited in connection with the serviceability of Federal Reserve Board surveys.

It has been pointed out, among other things that long-term forecasts of sales can largely ignore the effects of cyclical fluctuations in business conditions and that this renders such forecasts particularly helpful. However, short-term forecasts which are an integral part of an annual budgeting bump squarely into these fluctuations. The grass-roots approach to short-term forecasts will generally give full effect to the company representatives' opinions of the outlook for general business in the coming period, but beyond this approach lie methods of predicting consumer spending. Economic forecasting today centers largely on three segments of activity—business investment in plant equipment and inventory, government expenditures, and personal consumption expenditures. Forecasts of business investment currently are based on surveys of intention. Forecasts of government expenditures are usually based on the estimates of officials with reference to tax receipts and budget spending.

It is only in the field of personal consumption expenditures that much reliance has been placed on the analysis of historical data as a guide to projection of future performance. In this instance, a relationship is projected into the future for the forecast. Some of the forecasts based on this method in the post-war period have proved greatly in error. In fact, it is probable that in recent years a simple relationship between personal income and consumption has represented a poor guide to the future. Surveys of consumer finances indicate that consumer attitudes about future incomes, changes in income, use of liquid assets, shortages, etc., are important in their influence on consumers' decisions to spend or save their income. In other words, there are times when consumers spend a larger share of their income than they do at other times. As a substitute for forecasting consumer spending by projecting a relationship between income and consumption, data has been collected in the post-war period on consumers' intentions to buy durable goods and houses. The data represents some of the information obtained in the 3200 interviews conducted annually in the Federal Reserve Board's surveys of consumer finances.

From the analysis and interpretation of such data, the Board forecast for 1946

a demand for autos, other durable goods and houses that would exceed production at current prices. The Board also predicted that saving would be much lower than in 1945. The events of 1946 bore out these forecasts to a large degree. The rate of saving declined significantly and the amount of installment credit outstanding increased. Actual events in 1947 and 1948 also conformed closely to the annual forecasts made for those years. For 1949, the Board forecast an increased demand in comparison with 1948, for autos, television sets and moderate-priced houses and a reduced demand for other durable goods. Once more the broad pattern of demand bore out this forecast.

The Korean outbreak in 1950 nullified the worth of any forecast as it pertained to the last half of the year, but demand in the first six months of 1950 followed closely the Board's forecast for that year. When the Chinese intervened in the war at the end of 1950, consumers went on another buying spree and many economists believed that consumer demand would continue to increase and create a serious inflationary problem. Against these predictions, the Board's forecasts, based on consumers' statements of intentions to buy, indicated a reduction in 1951 in the demand for autos and other durable goods. The record of behaviour for 1951 followed the forecast again. Consumer expenditures for durable goods decreased from 1950 and personal savings increased markedly. The behaviour of the consumer sector of the economy served to offset the inflationary pressures and help stabilize the economy during that year.

The foregoing brings out two important points. First, it indicates that effective steps are being taken in the direction of more reliable short-term economic forecasting. As time goes on and such forecasts become more objective and extensive, they will serve as valuable guides to a substantial number of business enterprises. Secondly, as an example of getting estimates from the field by a sampling process, the Board's techniques may well be adopted by some private enterprises.

The Bottom Stays In

As further light on the difficulty of short-term forecasting, a reference to comments by Lawrence Fertig in *The New York World-Telegram and Sun* of May 3, 1954 will be helpful. In his column of that date, Mr. Fertig notes that some of the things which have not happened since the fall of 1953 may be of even greater significance than the events which have taken place. When the gross national product began to decline last year, it dropped from a rate of $371.4 billions in the second quarter to $359 billions in the first quarter of 1954. This

decline, according to many economists, should have set off a new series of events, but it did not.

The first thing which did not happen was a "chain recation." According to this theory, a deep recession should have resulted because cutbacks in one sector of the economy lead to cutbacks in others until the entire economy is undermined and depression results. Instead of this development, only a moderate set back ensued. After reaching $82 billion in September 1953, inventories started to slide, and fell to $80 billion in March this year. Production in factories and mines declined a little over ten per cent from the peak of the boom. Unemployment increased from 1.5 million to 4 million, but the rate of unemployment has now largely leveled off. Inventory cutbacks did affect production, but the decline in production has leveled off and purchases of goods today exceed production at the rate of $3 billion annually.

The second thing which did not happen was a sharp decline in investment for new plant and equipment. On the contrary, capital investment has held up remarkably well. In the third quarter of 1953 this investment represented an annual rate of almost $29 billion. In the first quarter of 1954, the rate was about $28 billion. The decline for manufacturing companies alone was from $12.3 billion to $11.6 billion, or less than 6 per cent.

The lack of any adverse "chain reaction" and the failure of business investment to recede sharply may indicate that we are not in cyclical recession and suggests that not every readjustment in the economic system is cyclical and cause for a "bust." The events taking place today may demonstrate that the gross national product can recede without grave consequences and that a drop in the gross national product, with a consequent sound readjustment of economic factors, can strengthen the general economy.

Combining Considerations in Short-Term Forecasting

Methods of forecasting short-term demand in actual use today ordinarily combine company field estimates with independent information. For example, the forecasts of demand for auto tires for replacement rely heavily on past records of new autos registered and gasoline consumed. This information, often augmented by sampling checks of the wear remaining in tires on the road, furnishes the data by which the tire industry, comprising a relatively few companies, can plan its production for the short-term.

The degree to which field estimates are relied on for budgeting can vary widely between companies and products. In one instance, a large manufacturer of industrial rubber products obtains a 100 per cent coverage of distributors and direct consumers in a survey of anticipated purchases for the coming year. This

information is combined into territorial totals. These are compared with the actual totals of prior periods, are modified in the light of anticipated general business conditions, are adjusted for the optimism of the sales force, and are then used as a guide in planning the utilization of equipment and the making of commitments for important raw materials, where procurement involves long lead times and contractual arrangements.

In contrast, a large manufacturer of metal cans surveys his customers, actual and prospective, to learn their anticipated purchases for the ensuing period. This information is vital in the proper planning of future operations, since the can manufacturer must not book his facilities beyond their practical capacity at the season of greatest peak demand, as he is able to produce and store only a small inventory of finished goods. In this case, the survey of customers' requirements is an integral part of the planning and budgeting process.

Use of the Sales Forecast—and Keeping It Adjusted

In the planning of the sales effort, the sales forecast should not be regarded as an infallible indicator of what the customers are going to buy. Rather, it should be used as a basis for study and broken down and compared with past results and with any long-range projection of sales. From this study can be prepared a sales program for a coming period, such a program to represent the best compromise between what is indicated as the market demand and what is regarded as an ideal sales mix by the company. In many of the cases in which the short-term sales forecast is developed from estimates from company representatives, based on information from customers, the forecast takes on many of the aspects of a study of market demand or requirements. As such, it resembles a market research study but not one without some bias. The efforts of marketing and merchandising executives are then required to fashion these field data into a forecast or sales program for budgeting purposes.

So much for the original forecast and its uses. What about continuing observation of market factors which may influence the sales forecast? We should note the various means by which we can keep in touch with what goes on in the field. As the first and most obvious agency, we have our own sales forces. The reports of sales representatives should include information concerning new prospective customers, new competitive products, changes in competitive prices, advertising and promotional developments. In many cases this reporting function of the sales force is supplemented by market research in the field. This is often done for the purpose of investigating situations or markets with respect to which sales performances are out of line with forecasts. In such cases, detailed research may be required to determine the validity of forecasts or to support a change in

the forecast. In addition, for branded consumer products which must compete strongly to hold their market position, independent agencies can supply retail sales data concerning the movement of the product in comparison with competition.

Altered selling conditions must also be taken into account. As we emerge from the unusual conditions of the post-war years into the era of the "hard sell," the tying in of sales forecasts to production and financial planning will take on added importance. During the years in which plant capacity was the limiting factor for the sales of many companies, marketing effort could be aimed at the most profitable items in the line and sales could be confined to areas in which distribution was the most economical. It is different now.

As an example of present changed conditions, let us take a look at a large manufacturer of drug-store products operating in Canada. Sales have grown rapidly for the past few years and now strain the capacity of the plant. Forecasts of future volume indicate that sales at current prices can be doubled over the next five years. As a consequence, substantial additional manufacturing space is now being constructed. Analysis of the geographical distribution of the additional volume which can be secured indicates that much of the increment will come from the western provinces of Canada, where transportation costs are high. Under the present sales policies, customers in those provinces pay some of the transportation cost, so that the rate of net profit on present business in those areas is satisfactory. However, full development of the sales potential of the western areas depends heavily on full absorption of transportation costs by the company plus, in all probability, the provision of branch service and delivery from a point such as Winnipeg.

These additional costs of distribution will reduce the profit margin on this business by at least one-third and also raise the break-even point because of the additional fixed costs of a branch in the west. The economics of the problem can be summarized as follows. Sales volume can be increased to 300 per cent of the present level but the first fifty per cent of increase will be required to restore the present amount of dollar profit. During the first two years of higher distribution cost, dollar profit from western operations will be less than at present. Yet, ultimately, sales volume will yield twice the profit now being earned, even though the margin is reduced sharply.

The Frame of Reference in Forecasting

In summary, I would like to make the broad and somewhat categorical statement that future years will see the sales projection increase in importance as a tool of management planning and that, as a consequence, the accuracy and re-

liability of sales forecasts must be improved. On the whole, over the long term, it is probable that the assurance of earning a profit from a given volume of sales is greater than the assurance that the sales volume will be obtained. The economy will continue to grow at a healthy pace, but we must expect competition to become keener. The company whose sales planning and strategy develops the products and the organization to obtain sales will also coordinate procurement and manufacture to produce a profit on those sales.

Also, we must remember that in our economy there exists over the years a relationship between prices, costs and profits. While this relationship may be disturbed for short periods of time, long-run conditions are such that intelligent management *should* produce a profit from sales volume. Of course, there are entire industries today which are earning no substantial amount of profit. For example, the producers of anthracite coal, full-fashioned hosiery and cotton woven goods would not be very enthusiastic about the foregoing statements about profits. Nevertheless, the slow process of shaking out excess capacity or of developing new uses for products or some other economic development (even sweating it out until the population catches up with capacity) must evolve a condition under which a return is earned on the capital employed in these industries. In other words, sales, cost, and profit forecasting cannot each be considered by itself. It is against the broad concept of the relationship of prices, cost and profits that we must, therefore, think of the future. The cost of labor has increased steadily over the past fifty years, but so have prices and the productivity of labor. And, since material costs are basically labor, we may expect that this cost element too will not get far out of line with the price level over the long-term.

Within limits, however, — for the short-term and the practicably forecast long-term—the sales forecast can be translated into a production program, the costs of which can be estimated on a fairly reliable basis. It is from this point that all the various alternatives must be developed and that vital questions arise. What inventory, if any, must be provided? What use can be made of facilities idled by changes in market demand? Shall we farm out work where our facilities are inadequate? With the solution of these and many other problems, a production forecast can be evolved, the details of which can conveniently be omitted here. The important thing to note about such a production budget is the set of basic cost factors on which it is based.

These costs should include the level of wage rates, the cost of important raw materials, the extent and nature of overhead expenses, the fixed and variable components of overhead, etc. From this point, the forecasting of production costs can take the form of measuring the impact on total costs of any change in

the basic cost factors, including a change in production rate which would affect overhead costs. Beyond this point, in the development of budgets of after-expense, the basic expenses should be broken down into fixed and variable elements. With this refinement, the impact on expenses and profits of changes in sales and market conditions can be measured and adjustment made, when necessary, to reflect such changes.

In presenting a forecast of operations or profit and loss, the net result arrived at has little significance in comparison with the need for a clear definition of the hypotheses and assumptions which are built into the forecast. It is far more important to explain "why" with respect to each principal element of income, cost and expense than it is to show "how much." Also, the effect on the whole of changes in these principal elements should be clearly outlined. Only through such emphasis can the real significance of the forecast be transmitted to the operating executives—and no forecast has any value at all unless it has meaning for the people who run the business.

Conducting a Continuous Cost Control Offensive

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The intensified programs described in the present article had their beginnings in 1949 and their further development to meet the exigencies of the year now closing. The four component programs which, with endeavors of like tenor in other directions, formed the company's spearheads of preparation for changed conditions, were (and are) called the inventory control, "red" variance, cost reduction, and order profit analysis programs.

DURING PERIODS WHEN CONSUMER DEMAND is at a peak and production is also running at top performance levels, it is common for business to relax its vigilance. Consequently, little emphasis is placed on problems which might be caused by a change of pace. Methods of control cost standards, and reporting procedures come to be regarded as means of providing information, rather than springboards for action. Hence, it is possible that a business which has enjoyed peak operations for an extended period, may find itself unable to turn around fast enough when it is faced with a recession or other changing economic conditions.

This article deals with the steps taken by one company when it was faced with a mild downturn in 1949, as these steps were reflected in the company's planning to meet another downturn in 1954. In meeting both the earlier and the later challenge, this company developed a management philosophy which might be described as consultative and participative. Every level of supervisory management became active in the task of planning the strategy and contributed to the making of calculated risk-taking decisions which would insure some stability of operations and profits. This made necessary the opening of lines of communications between all levels of supervisory management and the undertaking of a program of training and education of members of the management team.

Both general and specific programs of action will be discussed. It is interesting to note the extent of the contribution made by the controller's department in its extended service to all other departments and plants of the company. Each department and plant division has internal programs of action but, in reaching their goals, it becomes necessary for the controller and the works auditors to work in close co-operation with the individual departments in evaluating

changes which are necessary and co-ordinating inter-departmental operations. A good starting point is to review the general program for action as it found application in some of the departments other than the accounting division.

What the General Action Program Consisted Of

The president headed the top management action group, including the vice presidents of operations, engineering, sales and the controller. With this group he reviewed the progress made in the cost reduction program which had been in operation for a number of years. Because it was deemed important to keep communications open, to get the story down to every level of supervision, and to provide for the channelling of suggestions and recommendations back up the line to top management, the president brought the forecast of possible changes during the coming year directly to the operators' meetings. Here he emphasized that, while the outlook indicated changes in operating levels, the prospect was not dismal and could be met if everyone gave particular attention to cost reduction and control.

The operators set up weekly meetings for the purpose of discussing specific phases of cost reduction or the improvement of quality to meet competitive conditions which seemed to be on the way. These discussions of specific rather than general problems resulted in very good direct results. The operations vice president held meetings with the operating superintendents usually on the second Thursday of each month to review the suggestions flowing out of meetings held by operators in their departments and to specifically review increases in unfavorable cost variances. All cost variances were reviewed at these meetings using special reports developed by the works auditors with the co-operation of the operators and department superintendents. Through these meetings, the superintendents acquainted themselves more fully with the details of cost behaviour and obtained a better knowledge of their costs and results for the month. There has been a considerable improvement in the objectivity of their thinking.

The sales vice president also held meetings with his staff, which included all of the product division managers. Each of these staff members discussed the effect of changing conditions with specific reference to the products they handled. The profit position of specific items was reviewed in relation to other more profitable items and a pattern of product mix was developed which would result in the greatest overall showing for the company. Changing economic conditions, which threatened to affect the company's participation in their regular markets, were explored and the entire sales organization was alerted to keep in touch with customers' needs and changes in demand. Emphasis was placed on the

necessity to avoid, where possible, order cancellations which would disrupt production planning and on the additional drive needed to get maximum participation in the market for all profitable company products. Direct contact with both customers and the sales organization in the field was intensified and the vice president undertook a planned program of traveling throughout the territory.

Program Activated Through Accounting Staff

Under the general program and the approach taken by management to meet the changes which were foreseen, greater use was made of existing reports being prepared by the controller's division. The order profit analysis, savings statements on appropriations, forecasts, and continuing reports on cost reduction all found greater use by other departments. As a result of the information reported, many inquiries came to the controller's department for help and service in connection with the financial evaluation and analysis of internal departmental or plant operating problems. The manner in which this help was given through the specific accounting programs is discussed in some detail in the paragraphs which follow.

To maintain a close tie-in between top management and the operating departments, reports and information developed in the controller's division were expanded with particular reference to costs, variances from standards, and the effect of changing levels of activity on established practices and units of measurement of profits.

Inventory Control

One of these fields of program development was inventory control, which in its generally accepted sense, had been carried on at all times. On the basis of continuing analysis, increases and decreases in major items had been reported monthly, both to top management and to the superintendents. This reporting applied to semi-finished steel products, some of the finished steel products, and in a portion of the finished steel inventory. However, for proper interpretation it became necessary to report both the dollar value changes and quantity changes and to include comments explaining the true effect of any change in level.

To give the program strength in this area, the detail was expanded to included information on individual types of material making up the total inventory and full explanation of each major change. Such an analysis would, on disclosing that the dollar value of the inventory has developed a major increase, continue to explain that the prior period used as a base for comparison had

been one in which hand-to-mouth supplies were maintained. It would also indicate the number of days' supply now on hand in relation to operating requirements.

The matter of declining prices and excess quantities purchased or in stock was made an active subject of discussion with the purchasing agent, because the same economic changes which threaten the level of the company's operations usually have parallel effects on the suppliers of materials. It was found that many cost savings could be realized through delaying orders for stock to the full extent and limits which operating requirements would allow. An example of this was a delay in replacing orders for paper containers because of an expected price decline. The order was placed some twenty days after first being routed to the purchasing agent. This type of action took close co-operation between the operating department and the purchasing agent to be sure that operating requirements were met in spite of it.

Certain items in inventory were specified to be watched on a trend basis with the accounting department developing trend charts for this purpose. Some of these included certain types of waste products which had an ultimate use in other phases of the processing operations. Since some of these waste products were carried at no value on the books and since it required more skillful coordination to use them, the operators often deferred the use of these materials, thus increasing the cost of carrying inventory and without realizing the savings obtained by their use. The trend charts pointed up these conditions and pressure was kept on the various plants to get this type of material back into the process. Major reductions in tonnages were (and continue to be) made as a result of this type of reporting.

Also, to more definitely fix the responsibility for the continued control of inventories, the company established a works committee, composed of the assistant superintendent, chief inspector, department superintendent and an accounting representative. This committee was charged with making a physical inventory survey each month for the purpose of classifying products which had become slow-moving or obsolete. Although this thus became a prime function of the operating department, the fact did not relieve the works auditor of his responsibility for reporting trends and the status of tonnages carried in stock.

Stores inventories were also carefully watched under procedures still applying. Trend charts were developed on stores materials by classes. Action could then be taken. For example, when it was noted that the trend in electrical material and supplies was consistently upward, a special survey check was made. The increase prevailed, notwithstanding the fact that certain items were being written off as obsolete. This survey was brought to the attention of the general works

auditor, and, through co-operation with the purchasing department, availability and lead time requirements were reviewed. The conclusion in this case was that the supply of this type of stores was much easier than it had been and that the lead time could be shortened. By tightening up on lead time requirements and by reviewing many open orders with indefinite delivery dates, it was possible to cancel or revise many orders, reduce quantities on others, and arrange for deferred deliveries on some shipments.

"Red" Variance Program

The "red" variance program has become an important activity in recession protection. It meant emphasis on the reduction of adverse cost variances at varying levels of activity. Control reports to management were usually on a company-wide basis. Hence, when these composite reports indicated a net red variance it was natural to go back to the work papers and critically go into all adverse results. The program was designed to take one department at a time and analyze each factor, no matter how small, which contributed to the adverse showing. Many things were considered specifically which had been previously considered only on an over-all basis.

The program was under the supervision of the works auditors who handled all contacts with the general superintendent in a manner which allowed the superintendent to institute the request for the varied analyses which were made. These project analyses were entered into first at one of the plants and were soon expanded to include other steel works and ore mines. Each department survey or product analysis was set up as a project and continued until all the causes for adverse showings had been disclosed. When the analysis of a particular project was completed it was then written into a report with recommendations approved by the plant manager. This approval was his agreement to accept the report and his commitment to undertake the program of red variance reduction indicated.

Project case histories are reported in this section of the present article in brief to serve as examples of the type of results obtained. In the first project, adverse yields compared with developed standards were available on a month-to-month basis. This was the starting point. The next step was to make an analysis of yield by products (rather than on the entire operation) and these analyses were carried for extended periods to establish trends. On some products the unfavorable yields were traced to a practice of over-pouring of hot metal at the open hearth. Once the practice was corrected, the operation was then watched until it was sure that changes effected would not adversely affect the mill, for it is a common occurrence for a variance to be corrected in one operation at the

expense of transferring part of its effect to connected processing steps. Through presenting progressive reports on the project to the operating people for about two months, improvements in the operations were permanently established.

In a second project, the delay time at the temper mill was investigated. Delays in the past had been reported on a month-to-month basis, which distorted the facts. By developing an analysis on the basis of individual turns rather than on a calendar day basis and by carrying the individual turns over periods long enough to establish trends, it was possible to reduce the causes of the adverse variances to their annual effect in dollars and cents. In this case, the general superintendent had all the facts and could institute corrections within his division with very good results.

When the red variance program was launched, it was immediately apparent that part of the cause for adverse showings was the lack of information and improper analysis or reporting procedures. In many instances, poor operations and laxity in cost control was the end result of not getting the proper analysis of the causes into the hands of the operating chiefs. As the program developed and moved from department to department and from plant to plant, we assured the heads of the departments that they would have all the information necessary for cost control. The red variance program and the red flag signal, as it was to be known, reached both the operating and accounting departments at the same time through project reports. In some cases, corrective action could be taken immediately and, in others, extended or new projects had to be undertaken.

Many intangible benefits grew out of this program and have been of continuing and permanent value. The members of the accounting organization, as well as the supervisors in the operating department, obtained invaluable training in cost control and have become fully educated in the handling of standard costs in the control of operating practices. To carry on this program it has been necessary for the controller to strengthen his department with analytical talent by procuring new employees, which come mostly from college-type recruits. It also has given the works auditors a chance to become well informed and talk on a persuasive basis with management, generating enthusiasm for the program.

The red variance program has naturally resulted in indicating instances where standards needed correction. The company has been properly reluctant to make any revisions in standards once set with the co-operation of the operating men. However, since standards were based on many factors and sometimes had to be set at levels to get the product to the customers in a comparative market, some of the supervisors found them hard to meet. Because many of the new supervisors and superintendents had been promoted into these positions during

periods of expanded operations, few of them have had any experience in contraction of operations or in the necessity and technique of squeezing costs down to a minimum to meet competition.

Cost Reduction Program

The cost reduction program, which also had been active for several years, was a good solid foundation on which an intensified program to meet future needs might be built. When it was inaugurated and in its stepped up format, it was made the responsibility of a cost reduction committee appointed by the president. This committee reviewed (and continued to) all projects and approved those which merited direct action. Once a project was approved it became the policy of this committee to secure reports which developed the actual cost savings. These could then be compared with the savings estimated at the beginning. The committee scheduled regular meetings to review new projects, to check progress on others, and to discuss ways and means of generating ideas for new projects among the personnel of the company. Quarterly reports were instituted on all projects in all operating plants.

The success of a cost reduction program was (and is) dependent on the rate of flow of new ideas. For this reason, it is a function of the cost reduction committee to keep the flow active. By making regular reports on progress and bringing the results of this work to the attention of all plant superintendents and operating personnel, the program was sustained and further interest stimulated. This was accomplished by inclusion of cost reduction as a topic in the president's monthly letter. Special selected subject matter also came to be included in monthly analysis letters sent to superintendents, so that the latter could discuss the projects at the regular works operating meetings and keep the activity in proper forcus as an integral part of a broad program to reach the profit objectives of the company.

The cost reduction activity was further strengthened by a suggestion committee, which was publicized through periodic letters from the president, addressed to all supervisory personnel. A printed booklet explaining the operation of this committee and spelling out definitely the basis for awards was circulated throughout the entire organization. On the basis of our experience, it may be said that, if attractive awards are provided and if publicity is given both in plant organs and local newspapers, when awards are given, a suggestion system is usually a very valuable aid to management. It keeps the participative spirit alive among the employees.

It was found also important to have savings statements related to project appropriations to spell out in detail cost reduction sought on each project. The

proper scheduling of completion dates on projects turned out to be equally important, so that the facilities involved could be put in operation as soon as possible and the cost savings made a reality. We discovered that, unless these schedules were checked often, some of the facilities got into operation several months later than anticipated and savings were lost for that period of time. Since these savings had become an integral part of our profit objective it seemed vitally important to meet completion dates. A regular follow-up was established for this activity by the engineering department and reports were required from the superintendents as to progress, at weekly meetings and at other designated intervals. Through this follow-up procedure, items which needed acceleration or correction could be given prompt attention.

Overtime incurrence was recognized as another source of likely cost reductions. A program was launched requiring each superintendent to report and explain weekly the reasons for his department's overtime. Discussing these reasons at weekly meetings resulted in better co-ordination between certain activities of the company and eliminated some overtime. A monthly report of overtime by causes was devised and circulated to superintendents and other executives of operating departments. The company was thus able to eliminate the costly extended work week at one of its divisions and to considerably reduce overtime at other points by requiring justification of overtime on the part of the superintendent who authorized it.

Order Profit Analysis Program

A program referred to as the order profit analysis program was inaugurated at one of the smaller works in an effort to get one of the rolling mill operations on a profitable basis. It has since extended to other facilities of the company and is being used as a cost reduction stimulant. Originally under this program the cost-sales price relationship of the scheduled products was determined for all rolling mill operating units. This resulted in the transfer of products to lower cost facilities, either without any capital expenditure for equipment or else with an appropriation for the purchase of equipment enabling the lower production cost.

After using the techniques developed in the order profit analysis on current and past performance, the company then applied it to the predetermination of profits on orders before scheduling production. This procedure was very successful and was extended to all company plants. It was natural to proceed next from an individual order analysis to a "specification" analysis. This involved the matching of specifications with the method actually used in production and

then in matching specification costs with the sales prices. Many instances developed in which the sales prices did not recover all the production costs and, on the basis of directed special studies, recommendations were made to increase the price of extras and to assess certain other extras not previously considered in the price. It was possible to recover many of these extras well within aggregate competitive prices in the market. In other cases, some processes were eliminated and some products which moved in small tonnage lots were discontinued when it was found that a profit potential was nonexistent.

A by-product of the order profit analysis—and more particularly the specifications analysis—was that all over-grading and substitutions now have to be properly authorized usually by the general superintendent at each works, since these practices might result in added costs of finished products. Another important end result has been the policy that any changes in specifications in order to meet competitive conditions have to be authorized finally by top management on the basis of all facts developed, with the assistance of the controller's division. This insures that the management is fully informed as to changes necessary to meet competition and also provided with full and complete reports on which decisions are made. Prior to the inauguration of this program, the sales department in effect operated on a "closed door" policy. They made decisions as to sales policy on the basis of general information and considerations without knowing the full impact and effect of their decisions on the other contributing departments of the company. The program has opened the "door" and decisions are now made only after all specific information is requested and received.

Also, the accounting department has established from formulas taken from experience with the specifications analysis program a procedure for determining the adequacy of selling prices. Further, an advantage gained from checking prices on invoices at the works was the development of leads for order profit analysis projects. This provided a basis for tabulating and reporting on such items as sales deductions for freight, discount and other selling costs. In fact, the order profit analysis program and its derivatives have saved thousands of dollars for the company and have provided a valuable control over profit relationship by products, specifications, and margins of profit on the same class of product produced at two or more plant locations.

Other Programs to Protect Profits

For many years, a salvage department has handled surplus and salvage materials for us. All surplus material from operations, stores and other sources has been under the control of the salvage agent. It has been his responsibility to

screen requisitions for materials going into production to determine if any of the salvages units can be used or substituted. All materials which cannot be put to good use are sold by the salvage agent. Moreover, in his contacts he has provided valuable assistance to the purchasing agent in finding sources for certain hard to get materials. Also, through careful screening of material requirements, it is possible to channel some of the waste material back into production and help keep costs down.

The program of disposing of waste materials has been intensified and advantage has been taken of markets in which shortages exist and in which these materials find some use. Previous promotional work in finding uses for waste materials had developed considerable market for such items as open hearth slag, which is used in soil conditioners. Steps have been taken to obtain an expanded market for this waste material by getting it accepted in some states, within legal specifications and requirements. Flue dust and fines are rechanneled into production. There is also a program for the recovery of scrap metal from rubbish before delivery to the dumps.

Economic changes dried up the market which existed for disposal of "short lengths" of certain steel products during the steel shortage, when all short lengths were readily disposed of and cutting to specifications thus presented no major problem. The sales department had been able to find customers who would pay prime prices for these short lengths. While this market, in effect, evaporated, a special study of the problem resulted in a decision to utilize this material as scrap for the furnaces rather than to force it into markets with a softening effect on our prices for prime material.

The company has carried on several active research projects and continues to do so. Some of these include the disposal of sawdust from timber operations, uses of expanded basis slag, and improvement in furnace slag to meet certain area or state specifications. Within the company, projects cover the use of washer refuse and possible briquetting of ore fines.

Guides for Periods of Change

In order to foretell the effect of lower operation rates, a special survey was undertaken and budgets of labor, material and services were developed in varying percentages of optimum operations. The budgets were readily developed by utilizing standard costs and the information was adjusted for each downturn of five per cent in rated capacity. These budgets were referred to as "downdraft budgets." When they were completed, the management put the results of the analyses into a brochure which included the part each department was to

play in working under receding levels of operations. After the brochure and the plans received the approval of the departmental superintendent, the general superintendent and the manager of manufacturing operations, they became part of the department superintendent's file to be used as a guide during periods of change. Similar brochures were prepared for other administrative departments.

The complete brochure includes all down-draft budgets and is a working tool of top management, from which broad action can be taken when economic conditions change and as a recession begins to take hold. Because the entire program, with the sub-programs for action, was built on a consultative and participative type of management philosophy it quickly met with full acceptance by the entire organization. Under a program such as this, the management realized that every department required accounting assistance to some degree in evaluating decisions. Because of this, the controller and his staff were encouraged to work to the best advantage. The field open to accounting personnel has been greatly extended and their greatest value is not in reporting what has happened but in having a part in what is going to happen in the future.

Solving a Problem in Distribution Cost Analysis

by WILLIAM H. CHILDS

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Pointing out that distribution cost analysis may be conducted for any one of half a dozen or so recognizably important purposes, the present author makes it clear at the start that whether and how to apportion cost classifications for such analyses depends on which purpose is being considered. The paper then goes on to the solution of a problem calling for construction of analysis of distribution costs by product and by order size classes. Uses of these analyses are then indicated in text.

ALTHOUGH THE STUDY of cost accounting is most frequently directed toward product costs, fully as important for managerial purposes is the allocation of selling and administrative expenses. Of these, the selling cost and that part of the administrative expense which is applicable to getting the goods into the hands of customers may together be called distribution costs. They are period costs and are charged in total against sales for external reporting purposes. However, management may require analytical breakdowns of these items. Such presentations are called distribution cost analyses. They can be made in several ways. Product and order-size are the types illustrated in this article. Others may be made by territory, by type of customer, e.g., mail order, retail, wholesale, or by geographical area.

A distribution cost analysis of any kind is undertaken to furnish information needed by management in making decisions with regard to a number of problems. Without such analysis, a business may be serving customers or distributing products on which it sustains a loss. Certain of the decisions involved may be stated in the form of questions, as follows:

1. Shall the selling price of a product be increased or decreased?
2. Are small customers profitable enough to justify the sales effort?
3. Should advertising expenditures be increased or decreased for a product?
4. In what ways can distribution costs be reduced?
5. Does the trade discount policy properly reward the cost-saving customers?
6. Which products are most profitable and which are unprofitable?

Apportionment of distribution expenses may be used to effect analysis but cannot be in every case and need not be if a cost can be charged to a particular object in its entirety, i.e., is a direct cost to that object. An example would be

a salesman's salary charged to a specific territory. If the cost is properly distributable over a number of objects, it is apportioned. An example would be the distribution of bookkeeping and billing costs as among several types of customers. Direct costs give little difficulty. Apportioned costs are more troublesome. Equitable spreading of apportioned costs presupposes a valid factor of variability. In general, the factor of variability means the basis on which a joint cost is divided among several items.

Factors used for the apportionment of selling and administrative expenses are generally related to the volume of sales or orders or weight handled. This is in contrast to the distribution of manufacturing expenses, which are assumed to vary with the volume of production, as reflected by the number of machine hours, labor hours, etc. Frequently, one factor is used for the distribution of all manufacturing expense. For distribution costs, several factors are generally necessary. If there is to be an equitable distribution of an item, it should be an expense which changes in accordance with the factor of variability selected. For some items there is no such factor. For others there is a factor when the distribution is made for one purpose, as by order-size classes, but not when made for another, as by products.

An apportionment of cost should be made only when the cost varies fairly directly with the volume of activity, and is caused by the volume of activity. Certain costs meet both of those tests in any type of distribution. Thus, the costs of credit management may be assigned whether the analysis be by products, territories or customer classes. Others are assignable in one type of analysis but not in another. Sales salaries, for example, may usually be assigned to customers but not to products. Still others are not allocable in any case. Thus, the distribution of advertising costs is entirely futile. How can it be said that the more sales, the more advertising? It is likely to be the other way around. That is, more advertising stimulates greater sales. Each analysis, then, will reflect margins after allocable costs. The unallocable charges will be deducted in total from the total of the margins.

Distribution Expenses As Related to Products and Order Sizes

Since this paper is to deal with product and order-size analyses, it will be interesting to consider the allocability of distribution costs for these purposes. Combinations of factors may be used. For the purpose of this discussion, only a few are employed. They are included in Exhibit 1, which indicates also direct costs and costs not susceptible of allocation, in respect of the two types of analyses.

APPORTIONMENT BASES (WHERE APPLICABLE) OF DISTRIBUTION COSTS FOR PRODUCT AND ORDER SIZE ANALYSES

Expense	Type of analysis	
	By Products	By order-size classes
Sales salaries	Not allocated	Sales times number of customers in class
Sales traveling expense	Not allocated	Number of customers in class
Sales office	Not allocated	Number of customers in class
Sales commissions	Direct	Direct
Advertising	Not allocated	Not allocated
Credit management	Volume of sales	Number of customers in class
Packing and shipping	Weight times number of units	Weight times number of units
Warehousing	Weight times number of units	Weight times number of units
Bookkeeping and billing	Volume of sales	Number of orders
General selling and administrative	Not allocated	Not allocated

EXHIBIT 1

Broadly, the costs of getting the orders are not distributed to products. The costs of filling the orders may be so distributed. Both types of costs may be allocated to order-size classes. Thus, sales salaries, sales traveling expense and sales office expense are not allocated to products. There is usually no fair way to find the time devoted by a salesman to presenting Product A as against the time allotted to Product B, nor can traveling expense be charged piecemeal to one product as against another, unless a salesman sells only one product. A breakdown by products is also next to impossible for the costs of maintaining the sales office. They depend largely on the number of salesmen employed, not on their volumes in particular products.

On the other hand, the costs in question may be allocated to order-size classes if the customers are approximately equidistant from each other and if about as much time is spent in selling a small order as a large one. The concept is that the dropping of a small customer would allow the salesman to spend the time on a large one. The distribution is on the basis of averages. However, where the average does not describe a fairly typical situation, the distribution is futile. Thus, if the small customers are confined to a small area while the large ones are at distant points, an average of the costs of serving small and large is obviously an invalid measure.

There may be a question as to the reasons for the differences between variability factors used for products and those for order-size classes, where an item of expense is considered allocable for both purposes. Generally, the factors of variability for order-size classes are more refined than those for products. This is because they are much more easily ascertained. Thus, the number of orders of various size can be readily determined from invoices. A rearrangement to

determine the volume of products appearing on each order is not so easily done. The allocation to products is frequently on the basis of sales. Weight and units are used where they are applicable.

Advertising is not allocated either to products or to order-size classes. This means all advertising, even special product advertising. Advertising expenditures cause the volume of sales. The volume does not cause the advertising expenditure.

As to other costs not allocated for either product or order-size analyses, they are those which may as well be charged to one object as to another. They are overall costs. To break them up among products or order-size classes is likely to result in an improper distribution. Thus, little or no sales effort may be devoted to selling a certain product. To charge a proportion of sales salaries based on the ratio which the sales of the product bears to the total sales serves no purpose.

As already indicated, the problem to which this paper is devoted will illustrate analyses on the product and order-size class bases. It is based on the data shown in Exhibit 2.

Solution: Distribution Analysis By Products

The first requirement is allocation of expense to products. The factors of variability to be applied to various cost classifications are those given in the "by products" column of the list offered at the start of this article. As shown there sales salaries, sales traveling expense, sales office variable expense, advertising, and general selling and administrative expense are unallocable to products. Sales commissions are apportionable on dollars of sales. As the rate is specified as five per cent, the distribution is computed at that rate on the sales volumes indicated in Exhibit 2. Credit management costs are also distributed on the basis of sales, and can readily be distributed in proportion to the same sales volumes. Packing and shipping expense, distributed on a weight-times-units basis, can be divided among the products by first arriving at aggregate weight of each product sold from the units sold and weight data in Exhibit 2 and then breaking down total packing and shipping cost shown, in ratio to poundage. Warehousing is also divided on the basis of weight times units and the same procedure applies to the amounts shown for it. Because bookkeeping and billing goes to products on the basis of sales, its distribution is like that for credit management cost.

The results of these computations are assembled in the product profit and loss statement shown as Exhibit 3. It will be noted that only those costs are

DATA FOR ILLUSTRATIVE PROBLEM

Order-size class	Number of customers	Number of orders	Total sales	Product sales X	Y	Z
Under $25	1,000	6,000	100,000	35,000	40,000	25,000
$25 - $100	250	4,000	300,000	105,000	120,000	75,000
$101 - $200	100	4,000	600,000	210,000	240,000	150,000
Over $200	50	1,000	400,000	140,000	160,000	100,000
Totals	1,400	15,000	$1,400,000	$490,000	$560,000	$350,000

The weights of the products are as follows: X - 1 pound, Y - 3 pounds, Z - 2 pounds.
Sales commissions are 5 per cent of sales.
Cost of sales are: X - $252,000, Y - $294,000, Z - $280,000.
The number of units sold are as follows: X - 98,000, Y - 70,000, Z - 175,000.
Selling and administrative expenses for the year 1953:

Sales salaries	$38,250
Sales traveling expense	28,000
Sales office variable	14,000
Sales commissions (5%)	70,000
Credit management	15,400
Packing and shipping	32,900
Warehousing	16,450
Advertising ($50,000 on each product)	150,000
Bookkeeping and billing	42,000
General selling and administrative	120,000
Total	$527,000

Required:
1. An analysis of selling and administrative expenses by product showing the allocation of expense to products and a product profit and loss statement.
2. An analysis of selling and administrative expenses by order-size class, showing the allocation of expense to order-size classes and a profit and loss statement showing analysis by order-size class.

EXHIBIT 2

distributed which may be directly applied or which vary with the volume of activity and are caused by that volume. Thus, sales salaries and other order-getting costs meet neither condition for products. This analysis by products suggests certain things with respect to company policy.

Product Z perhaps deserves major attention on the basis of the figures. It will be noted that the advertising appropriation, $150,000, was spent equally among the products. Thus, $50,000 was spent to advertise Product A, although it returned only $11,900 after the distribution of allocable costs. A study of past advertising expenditures in relation to sales should be made. It is possible that the demand for Z is relatively inelastic and that extensive advertising is largely wasted. In any case, the company would have to sell more than four times as much of Z to cover the present advertising allowance, let alone any other part of the unallocable costs. Possibly, the pricing of Product Z should be investigated. It will be observed that its margin after allocable costs is only 3.4 per cent of sales. This is all that remains for all other expenses and profit and would still be the amount per dollar which would be left if the volume of Z were increased. It appears that the selling price of Z is too low. Perhaps this is because it had not been noticed before that Product Z is responsible for a large proportion of the handling costs—packing and shipping and warehous-

ing—because of its weight in relation to its sales value. Moreover, commissions are paid at the same rate on Product Z as on the more profitable items. Lower rates are indicated for Product Z. The idea would be to inspire sales effort in the direction of the more profitable products.

On the broad pictures, three courses of action are available in connection with Product Z. They are to drop the item, curtail advertising expenditures and commission, or raise the selling price with, perhaps, more intensive sales promotion.

Whatever is done, it is significant, for our purposes here to recognize that the partial allocation of distribution costs displayed in Exhibit 2 gives a fairly clear picture of the contribution of each product to the profit of the company. The situation of Product Z would have been completely obscured if it had been charged with the order-getting costs, advertising, and general selling and administrative expenses. As it is presented, we see that only 3.4¢ out of each sales dollar from Z *could* remain for further expenditure, regardless of the volume. Obviously, the company can hardly afford to spend 14¢ out of each dollar for advertising the product, as it is now doing. Nor could it afford to pay higher commissions on sales or allow greater trade discounts to customers while maintaining the present price for Z. On the other hand, it is also seen that, before the unallocable costs are applied, the product is returning a small margin.

Solution: Distribution Analysis By Order-Size Class

The distribution of expense to order-size classes can be considerably more extensive than to products, as will have been noted from the list of functional accounts and related allocation bases given for both types of analyses in Exhibit 1. Thus, assuming that the selling effort requires approximately the same amount of time for the small order as for the large order, certain additional costs may be allocated which were disregarded for the allocation to products. Sales salaries, sales traveling expense and sales office variable expenses are apportionable to order-size classes. Advertising and general selling and administrative expenses remain unallocable.

Sales salaries are distributed on the basis of number of customers in the various order classes, weighted by the sales to each class. Thus, the basis of allocation is by customers, with the assumption that the volume sold to a class will affect the amount of effort devoted to the class. Multiplying the applicable number of customers in an order-size class by the dollar sales in the same class (Exhibit 2) and dividing each result by the total of all, gives a fraction by which to effect distribution of the sales salary figure. The distribution of the

PRODUCT PROFIT AND LOSS STATEMENT WITH ANALYSIS OF DISTRIBUTION COSTS

	Products			
	X	Y	Z	Total
Sales	$490,000	$ 560,000	$ 350,000	$ 1,400,000
Cost of sales	252,000	294,000	280,000	826,000
Gross profit	$238,000	$ 266,000	$ 70,000	$ 574,000
Allocable expense				
Sales commissions	$ 24,500	$ 28,000	$ 17,500	$ 70,000
Credit management	5,390	6,160	3,850	15,400
Packing and shipping	4,900	10,500	17,500	32,900
Warehousing	2,450	5,250	8,750	16,450
Bookkeeping and billing	14,700	16,800	10,800	42,000
Total allocable expenses	$ 51,940	$ 66,710	$ 58,100	$ 176,750
Margin after allocable expense	$186,060	$199,290	$ 11,900	$ 397,250
Margin percentage of sales	38.0%	35.6%	3.4%	
Unallocable expense				
Sales salaried				$ 38,250
Sales traveling expense				28,000
Sales office				14,000
Advertising				150,000
General selling and administrative				120,000
Total unallocable expense				$ 350,250
Net operating profit				$ 47,000

EXHIBIT 3

sales traveling expense is made on the basis of the number of customers. A fraction for each class for this distribution is arrived at by dividing the customers shown in each class by the total number of customers. A like procedure is followed for sales office variable expense, also distributable on the basis of the number of customers. This concludes the treatment of the allocable expenses for order-size class, not allocated for products.

As in the analysis by products, sales commissions are applied directly on the basis of the sales to a class at the 5 per cent rate. The cost of credit management, distributed over sales value in the product analysis, is distributed on the basis of the number of customers in the respective classes. It is assumed that it takes as much effort to investigate and collect from a small as from a large customer. Packing and shipping and also warehousing expenses are distributed on the basis of the weights times units, as sold to the various customer classes, easily determined for the product analysis but more difficult to find for a customer-size-class analysis, since the invoices once sorted for size class would have to be again sorted by product to apply weights. To avoid this complication in the above data, the volume of various products sold to each class is assumed to be in a single relationship, that is, the ratio of weight of sales of X to Y to Z is always 7 : 8 : 5. The distribution is, therefore, exactly as though sales were the factor of variability. Bookkeeping and billing expense is distributed on the basis of the number of orders rather than sales as in the product analysis.

These various computations for order size class analysis are effected in Exhibit 4 using the case data in Exhibit 2. As the question to be answered by the product analysis was which product or products are unprofitable as they are now marketed, so the order-size-class analysis furnishes data on the relative profitability of selling various sizes of orders. It is usually desirable to increase the

PROFIT AND LOSS STATEMENT WITH ANALYSIS OF DISTRIBUTION COSTS

	Order-size classes				
	Under $25	$25–$100	$101–$200	Over $200	Total
Sales	$ 100,000	$ 300,000	$ 600,000	$ 400,000	$ 1,400,000
Cost of sales	59,000	177,000	354,000	236,000	826,000
Gross profit	$ 41,000	$ 123,000	$ 246,000	$ 164,000	$ 574,000
Allocable expense					
Sales salaries	$ 15,000	$ 11,250	$ 9,000	$ 3,000	$ 38,250
Sales traveling	20,000	5,000	2,000	1,000	28,000
Sales office variable	10,000	2,500	1,000	500	14,000
Sales commissions	5,000	15,000	30,000	20,000	70,000
Credit management	11,000	2,750	1,100	550	15,400
Packing and shipping	2,350	7,050	14,100	9,400	32,900
Warehousing	1,175	3,525	7,050	4,700	16,450
Bookkeeping and billing	16,800	11,200	11,200	2,800	42,000
Total allocable expenses	$ 81,325	$ 58,275	$ 75,450	$ 41,950	$ 257,000
Margin after allocable expense	($40,325)	$64,725	$170,550	$122,050	$ 317,000
Unallocable expense					
Advertising					$ 150,000
General selling and administrative					120,000
Total unallocable expense					$ 270,000
Net operating profit					$ 47,000

EXHIBIT 4

average sold to a customer since, for many categories of expense, the cost is approximately the same, regardless of the size of the order. Comments on the facts revealed by the order-size analysis are made in the following paragraphs.

The analysis indicates that, after the allocation of the allocable costs, the smallest orders showed a negative margin of $40,325.. It will be observed that almost one-third of the costs of getting the order—sales salaries, sales traveling expense, sales office variable expense, and sales commissions—are allocable to this particular class. They total $50,000 for the class. If these customers could be persuaded to order by mail or telephone or if they could be encouraged to enlarge their orders so that fewer sales calls would be required, a large part of these costs could be avoided. It might mean the "separation" of salesmen or their transfer to other territories. A reduction in the sales office staff might also be made.

A second alternative in dealing with the negative margin in this class would be to increase prices. The amount of increase should be sufficient to cover, at least, the negative margin sustained after allocable costs. This might result in the self-elimination of many of these customers. Assume, for illustration, that prices are raised $40,000 on sales to the under-$25 class. That is a 40 per cent increase on the $100,000 of sales to that class. The percentage would be added to the list price for all customers, but the trade-discount schedule would be modified to partially or completely cancel the rise on the profitable orders.

Thus, the order class size analysis indicates two major alternatives. These are to reduce distribution costs to the under-$25 order class by changing the method of selling or to increase prices to that group by a percentage sufficient to cover their share of the allocable costs. A combination of both may be feasible. The differential trade discount plan may stimulate the placing of larger orders from the small order groups.

A Method for Still Broader Application

This paper has illustrated the construction and pointed out some of the values of distribution cost analysis, applied to products and applied to order size classes. It has been intended to introduce the technique of selective partial allocation of distribution costs for these and other analytical presentations, such as for sales territories, customer type or industry, and many others. Such analyses, properly carried through, can disclose to management many significant situations, otherwise hidden, which it is necessary to know about for effective operation.

Pricing for Return on Investment

by P. M. CHIUMINATTO

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Focusing attention on the cost landscape when management has determined that it wishes to earn a satisfactory profit in relationship to conversion cost and total assets employed, this article develops the principal features of a pricing policy under these circumstances and is replete with a large number of pointed comments on pricing policy as affected by cost.

THE ULTIMATE OBJECTIVE of a pricing policy is to formulate a program so that, over the economic cycle, the return on capital employed in the business will be satisfactory and in keeping with expected results. A proper and effective pricing policy is the result of coordination of management decisions on costs, volume and net earnings after taxes. The policy should embody the long-range objectives of management and should be definite but flexible, should lend itself to periodic control, and should consider average return on investment.

It's Easy to Get Too Many Answers

As a practical matter the pricing policy of a business is determined in a number of ways. The more important are:

1. Competition or monopoly prices.
2. Actual cost basis plus profit.
3. Standard cost basis plus profit.,

We shall pass over the first one. If competition is such that a company cannot get more than a certain price for its product, it must either be able to make a profit at that price, get out of business, or develop new lines and new fields of endeavor. If the company is fortunate enough to enjoy a monopoly, it should carefully consider the profits to be realized from the additional markets to be had as the price is reduced. Here, our attention will be directed to the second and third alternatives. However, before discussing them, we must arrive at a set of given facts relative to the cost of the product to be used in evaluating the various methods. The facts for a preliminary illustration are assumed.

	ACTUAL COST		STANDARD COST	
	Product A	Product B	Product A	Product B
Raw material	$ 4.50	$ 8.00	$ 3.90	$ 7.50
Direct labor	2.25	2.00	2.10	1.90
Burden	3.25	3.00	3.15	2.85
Subtotals	5.50	5.00	5.25	4.75
Selling, etc.	2.00	3.00	2.00	3.00
Total cost	$12.00	$16.00	$11.15	$15.25

If the company determined it wanted to make 20 per cent on sales and used actual cost as a basis, its selling prices would be $15.00 and $20.00, respectively. If it determined it wanted to make 20 per cent on sales and used standard costs as a basis, its selling prices would be $13.94 and $19.07 respectively. These four selling prices would reflect a decision to base profit or return on investment on the overall cost of the product including raw materials.

On the other hand, the company could decide that it was not entitled to a profit on raw materials (and might not figure profit on commercial overhead) and should make its profit or return from the added effort it put forth in the form of direct labor and burden absorbed. On the same costs the ratio of profit on one unit each of A and B is 66.67 per cent of the added (labor and plant burden) cost on the basis of actual costs and 66.00 per cent of added cost on the basis of standard costs. The selling price of Product A, based on actual cost would compute to $15.67, and that of Product B, $19.33. On the basis of standard costs, the selling prices would be $14.62 and $18.39, respectively.

We now have four different selling prices for each product, two apiece under each of two methods which have found a place in the field of industrial accounting. A discussion of the relative merits of each method will not be supplied here. The example is given merely to show how results vary and the necessity of a proper pricing policy to obtain maximium production and sales and the realization of a proper return on the total investment. To simplify the entire subject it may be said that, no matter what pricing policy a company follows, there is one question common to all: What is the proper price to be charged so that each product will return the (1.) same rate on the total capital employed to produce it and (2.) the amount management feels it should in relation to economic conditions.

Information Needed Before a Pricing Policy Can Be Formulated

This paper will take the reader through a step-by-step method of determining the answer to the above question, based on seeking a proper return on total in-

vestment, and relating the return desired to conversion cost at normal standard long-term production volumes. This involves knowing the products to be manufactured, what the normal rate of operation is, the establishment of standard volume, and plant capacity. We are not going to enter into a discussion on the products to be manufactured. That is for the sales and allied departments to determine. For the purpose of this paper, we are going to assume that such a forecast has been made and approved by management, which now wants to know what the selling price should be to make the desired return on total investment.

The normal rate of operation is one of the most difficult of all figures to compute, because of the nature of expansion programs in any industry and the consumption pattern of its products, together with the intervening economic cycles of boom and depression. The usual pattern is one in which consumption catches up with production, production is increased in greater proportion than the demand, and temporary unused capacity results. It is something like the pattern depicted in Exhibit 1.

In determining the normal level of production, management must be neither too optimistic nor too pessimistic but must take a realistic look at past operations, relative position in the industry, and expected future growth, to arrive at a figure which will most nearly reflect operating conditions of the future. If operations are estimated at too high a level, the result will be too great a profit and too high an expected return on investment. If operations are estimated at too low a level, the result will be smaller profits and a lower than expected return on investment. The determination cannot be exact but a practical calculation can be made.

Standard volumes must be calculated in order to determine the cost level at which the products will be manufactured, and whether or not there will be over- or under-absorbed burden.

How extensive a plant and auxiliary equipment to operate is an important matter. A basic policy on the matter of controlling the investment in plant and equipment is essential in the orderly conduct of any business. Here is how it would work. A policy is established to the effect that investment in plant and equipment will be maintained at 125 per cent of normal demand in order to take care of peaks or temporary booms. Then, the normal operations for cost purposes are determined to be 80 per cent of capacity. If the plant operates at less than 80 per cent of capacity there is unnecessary investment and, if such condition persists over a period of time, remedial action should be taken to again get this factor in line. Obviously, one of the figures in the demand curve has been incorrectly estimated and must be corrected.

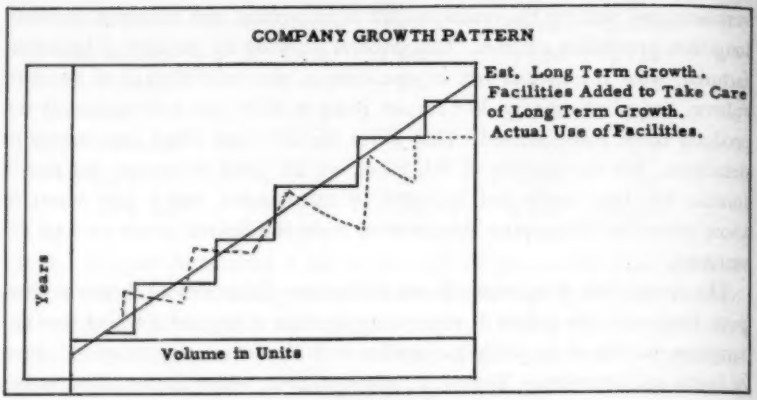
COMPANY GROWTH PATTERN
Est. Long Term Growth.
Facilities Added to Take Care of Long Term Growth.
Actual Use of Facilities.
Years
Volume in Units

EXHIBIT 1

It has been said that the pricing policy to be outlined in this article will embody the element of return on total investment. This is not to be confused with return on invested capital. If there are $500,000 worth of assets employed in a business and the equity holders invested $300,000, a net profit of $50,000 after taxes represents 16⅔ per cent of invested capital but only 10 per cent on total investment. In the long run, additional investment in the business cannot be found, nor should the stockholders' earnings be withheld for reinvestment in the business, unless there is hope or a possibility of an adequate return on total assets, commensurate with the risk undertaken.

Analysis of Costs for Pricing

At this point, having indicated how pricing policy is, in general terms, related to operating considerations and investment, it will be helpful also to discuss the relationship of cost behavior to pricing. In doing so, we will take the opportunity to introduce the assumed data of our example. In most manufacturing companies, the principal classifications of cost are raw materials, direct labor, burden, selling expenses, administrative expenses, and financial expenses. All of these expenses, in the language of the accountant, are variable with production or sales, fixed with regard to production or sales, or partly fixed and partly variable. The cost of production and sales from month to month will vary with volume, depending on how much of these expenses are fixed and how much will vary in proportion to volume. An actual breakdown of fixed-variable or semi-variable costs and expenses for an individual company must be determined from past experience, engineered standards, and graphs of volume and expenses over a period of years to find out the expense behavior.

It is not good pricing policy to change sales prices with the monthly variances in costs. Standard cost of standard volume is the more accurate basis for determining long-range sales policy and management decisions and the application of a fixed burden rate on standard volume enables management to see by comparison with actual volume and costs what variations in production and sales will do to the profit and loss statement by way of under or overabsorbed burden. This variance is kept out of the pricing policy—and also out of the inventories by charging it off monthly to the profit and loss account where it stands out for all to notice and do something about.

With this in mind, we can set up our case as in Exhibit 2 and in search of a selling price for a single product or product line based on costs we can compare costs at an assumed rate of operation, with standard volume at standard cost (direct costs assumed 100 per cent variable). The standard column in the exhibit provides the amount to be charged to various products preparatory to determining the ideal selling price. As a comparison, the unit cost lines give us conversion costs at standard volume and 125 per cent of standard volume which, if we insert an assumed figure for material unit cost of $1.25 gives us a unit cost of $7.20 at standard and $6.73 at 125 per cent of standard.

Required Return on Investment

We now have the costs we must cover and we could work a sales price on that basis alone. However, it will be remembered that we are to achieve a return on total investment. We are not concerned with a highly seasonal business but are assuming that production will, within normal limits, run fairly uniform from month to month and that total investment employed will be in proportion to the sales. We have set standard volume at 100,000 units and our unit cost figures give a $5 standard factory cost. This gives total standard cost of standard volume as $500,000 and, if we suppose fixed assets also to stand at that amount, we have a one to one relationship, which is worked into the bottom of the following table illustrating, on assumed figures, capital ratios of working capital items:

	RELATIONSHIP	NORMAL TURNOVER FIGURES	CAPITAL REQUIREMENTS IN RATIO TO:	
			Sales	Factory cost
Cash	Sales	20 times	.05	
Accounts-receivable	Sales	25 times	.04	
Raw material	Cost	12 times		.0833
Finished goods	Cost	12 times		.0833
Total working capital			.09	.1666
Add fixed investment				1.000
Total capital employed			.09	1.1666

CONVERSION COST COMPARISON

	Present rate of operations of the business	% to normal	Standard production
Units produced and sold	125,000	125	100,000
Direct labor	$250,000	125	$200,000.00
Burden costs			
fixed expenses	$100,000.00	100	$100,000.00
semi-variable	57,500.00	115	50,000.00
variable	31,250.00	125	25,000.00
Total burden	$188,750.00*	107.85	$175,000.00
Manufacturing cost	$438,750.00		$375,000.00
Manufacuting cost per unit	3.51		3.75

*Note: Absorbed burden at 125% production will be 218,750, an over-absorption of $30,000.00 which will appear in profit and loss as a credit.

Selling, administrative and financial expenses			
fixes	$85,000.00	100	$85,000.00
semi-variable	54,700.00	110	49,700.00
variable	106,250.00	125	85,000.00
Commercial expenses	$245,950.00	111.92	$219,700.00
Commercial cost per unit	1.97		2.20
Ratio to sales	23.28%		26.00%
Sales	$1,056,250.00		$845,000.00

EXHIBIT 2

Before we use these results for sales prices implications and to orient ourselves, it will be helpful to look at past experience to find the rate of return at which we should aim. Perhaps turnover of assets of the company over the past five years (but examine each year) has been 1.58 per cent to sales, and net profit 11.2 per cent to sales, computing to a return of 17.7 per cent on investment, compared with figures for competition of 1.7 times 12.0 or 20.4 per cent. Based on the knowledge of the business, it may be that management has to determine what to use as an equitable basis for return on investment. In our case, we will assume the half-way mark between our average and what our competition is doing, or 19 per cent.

Computation of the "Desired Sales Price"

We can now draw our various figures together and calculate the ideal price for the product:

	Ratio to sales	Ratio to factory costs
Working capital	.0900	.1666
Fixed investment		1.0000
Total investment	.0900	1.1666
Add return of 19 per cent	.0171	.2216
Add allowance for expense of distribution (Exhibit 2)	.2600	
Gross margins needed over and above factory costs	.2771	.2216

$$\text{The formula then becomes } \frac{1 \text{ plus } .2216}{1 - .2771} = 1.6900$$

Thus, in order to obtain a 19 per cent return on investment, the selling price must be 1.69 of the cost of production. (This holds true only if the standard figures used for costs and operation levels are maintained. As stated before, unless the variance from standard is significant or one which cannot be controlled, no change should be made in the selling price or the formula. More attention must be devoted to bringing the out-of-line figures back to the standards originally thought possible.) On the basis of this percentage, our specific production unit costing $5 at standard should be sold for $8.45, if we are to obtain the desired return on our investment.

The proof of the figures so far developed is shown below.

Standard number of units (Exhibit 2)		$100,000.00
Desired selling price (above)		8.45
Resulting net sales		845,000.00
Less standard cost of sales at $5	$500,000.00	
Less selling expense at 26% of sales (Exhibit 2)	219,700.00	719,700.00
Net profit		$125,300.00
Cash and receivables	.09 to sales	$ 76,050.00
Inventories	.0986 " "	83,317.00
Fixed assets	.5719 " "	500,000.00
Total capital invested		$659,367.00
19 per cent return		$125,300.00

Note: The sales ratios for Inventories and Fixed Assets are determined by dividing the sales ratios previously given by 1.69.

It is not always possible to sell one's products at the ideal sales price, but, through the procedure illustrated, a gauge has been established on which to judge the efficiency of management and those who control the finances of the company. In actual operations, management has to meet such developments as competition, bad scheduling to please customers, high peaks and low valleys in production, changes in raw material usages and costs of breaking into a market.

In the long pull and after finding out why the company is not meeting its return on investment figures, management might, in the light of changing economic conditions, have to revise the rate of return it is willing to accept. It might have to reduce the 19 per cent to something much lower and might just as well be able to raise it to a better figure. The price is calculated to give optimum return at standard cost and volume. When it does not do so, there will always be a reason, which can be found and accounted for.

Chart and Compass

As stated earlier, many considerations determine a sales price. However, a knowledge of cost considerations is like a compass in finding the direction to profits. Without a compass and without a navigation chart, the captain of a liner would never get to port. Properly equipped with chart and compass, he knows where he is, where he wants to go, and what his deviation is. It is up to him to make a decision to get back on the course, head for another port until the storm blows over, or "stay with it" and take his chances. A pricing policy based on return on total investment on the basis of standard costs and estimated plant capacity, constitutes modern control equipment and should be used by management as a yardstick to measure efficiency.

Perspective on the New Renegotiation Act

by DAVID S. MOFFITT

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It is the center of thinking in this article that renegotiation proceedings may be "stiffer" from now on because of prospective reductions of the Renegotiation Board's case load, resulting from broadened exemptions in the revision of the 1951 Act, enabling closer attention to individual cases. In the light of this viewpoint, the author reviews the principal changes which have been made in the law and, more particularly, the statutory factors which the Board must consider in reaching conclusions.

LATE IN AUGUST, 1954, President Eisenhower signed into law H.R. 6287, the extension of the Renegotiation Act of 1951, which had been passed during the closing hours of the 83rd Congress. Besides extending renegotiation of defense contracts and subcontracts for one year, through the end of 1954, Congress provided for three basic changes in the 1951 Act:

1. Increase in the minimum sales amount subject to renegotiation from $250,000 to $500,000 for all years ending on or after June 30, 1953.
2. Exemption of standard commercial articles from renegotiation, both at prime and subcontract level effective January 1, 1954.
3. Inclusion of prime contracts as well as subcontracts under the old partial mandatory exemption for new durable productive equipment.

Nature of Principal Changes

The lifting of the renegotiation floor from $250,000 to $500,000 will come as welcome relief to a large number of relatively small contractors. While this does not appreciably reduce the total amount of sales that will be renegotiated, it does remove a large number of firms from the renegotiation process. This change is effective for all years ending on or after June 30, 1953 and companies with renegotiable sales near the new floor should determine whether or not they fall below it, by reexamination of their process for determining which sales are subject to renegotiation. Checking sales invoice by invoice may be better in some cases than the easier flat percentage of shipments method. Even the company's position with respect to the stock item exemption should be reexamined. Finally, if the new provision for standard commercial articles applies, it should be used to reduce renegotiable sales.

The exemption of any contract or subcontract for the making or furnishing of

standard commercial articles is new to renegotiation, and the Renegotiation Board estimates that standard commercial articles make up about 60 per cent of defense procurement. Even if, under the definitions written into the law, there is doubt that the amount of renegotiable sales will be reduced by that proportion, the effect of the exemption will be widespread. Under the law as passed, a standard commercial article is defined as one which is customarily manufactured for stock and is customarily stocked by the manufacturer or by his dealers or, alternatively, one which is manufactured and sold by two or more persons for general civilian industrial or commercial use. Since the Board will require documentation on the point, companies desiring to claim exemption should start collecting data now before much of the information is lost or forgotten.

For instance, shop orders and inventory records may be sufficient to prove exemption under the first alternative. For the second alternative, proof is needed that at least three firms have manufactured the article and sold it to the civilian trade. Price lists or catalogs describing uses of the article may be availed of along with advertising, to show this. Even if the contractor's sole output is for military usage, it is apparent that the exemption can be obtained if three other companies make and sell the product to the civilian trade.

Even if the standard commercial article definition is met by the product in one way or the other, the Board can deny exemption if it can show, within six months of the contractor's filing, that the competitive conditions affecting the sale of such an article will not reasonably prevent excessive profits. Hence, the data compiled to prove exemption under the standard commercial article provision should be expanded to show that the competitive conditions under which sales were made reasonably prevented excessive profits. Unless collusion exists, competition *per se* should reasonably prevent excessive profits, particularly in these days of a buyers' market. Nevertheless, proof of active price competition among a number of suppliers should be documented, if possible, to forestall a showing by the Board to the effect that competition did not prevent excess profits.

Finally, the manufacturers of new durable productive equipment have almost achieved their goal of being completely exempt from renegotiation. Not only does the standard commercial article exemption apply to many products of this industry, but the partial mandatory exemption which was developed under the original 1951 Act with respect to sales to defense contractors has been extended to sales directly to the Government. Inasmuch as the trend has been toward the Government's buying special production equipment and supplying it to its contractors, this change will probably be even more beneficial than appears on the surface.

Probable Effect of Changes Upon 1954 Renegotiations

The net effect of these changes in the renegotiation act would certainly appear to be a great reduction in the number of cases the Board will have to handle. It may very well be that the case load will drop from 45,000 a year to 25,000. For companies which will still be subject to renegotiation, this means several important things. First of all, with a lighter case load, the Board can spend more time on each case, despite the fact that its appropriation was cut from $5,200,000 to $4,500,000. This means that the calibre of renegotiation filings will be considerably higher for the year 1954 and that a poorly put together set of arguments will suffer by comparison.

Therefore, in 1954, more than ever before, justification will be required for the renegotiable profits earned. The changes in the 1951 Act have not changed the six statutory factors which must be used by the Board in determining whether or not excessive profits have been earned. The process of renegotiation is one of negotiation rather than determination and, with more time for each case, the Board may be expected to go into negotiation more thoroughly prepared than ever before. The contractor should, too.

In a previous paper ("Preparing Your Argument in Renegotiation," *N.A.C.A. Bulletin,* May, 1952), the present author pointed out that the best way to avoid repayments of profits is to prepare the best possible argument that profits are not excessive, utilizing the six factors to be considered by the Board. These factors are:

1. Efficiency of the contractor.
2. Reasonableness of costs and profits.
3. Capital employed.
4. Extent of risk assumed.
5. Contribution to the defense effort.
6. Character of business.

In handling a case, the Board, after it has collected all the facts for a particular year, starts to analyze them in accordance with these six factors, to determine whether or not excess profits exist.

Character of the Business Factor

Although it is listed last, the factor of character of business is considered first by the Board because it provides a very useful framework for the other factors. The law and the regulations call specifically for consideration of certain ratios, but it is also very important for the contractor to develop a true overall picture in order that the other factors can be taken up in a favorable light. For instance, one contractor has been able to demonstrate an increasingly integrated operation which, as such, is deserving of a higher rate of return. The development of in-

tegration as a framework for all other renegotiation factors has produced consistently favorable treatment for this contractor.

There are several interesting facets to the character of business factor, specifically concerned with the amount of integration. Although it is public policy to develop as much business as possible for small concerns by means of subcontracting, a considerable amount of subcontracting is indicative of a lack of integration of the prime contractor and, therefore, reason to attack some profits as excessive! Nevertheless, the prime contractor has a "comeback," in that he is following public policy and, if he shows that he has supplied the subcontractor with a large amount of technical assistance, he should come out all right. This whole matter points up the importance of completely documenting relationships with subcontractors.

Further, with respect to integration as reflecting character of the business, there have been some indications lately that the Board may be giving some consideration to justification of profits from the value added standpoint. As a theory, the value added principle considers profit in relation to the amount of direct labor required to bring the raw material to a salable condition. Under this theory, the integrated producer with high labor charges should normally be allowed to earn more on his sales than the producer who merely buys parts and assembles them. However, if the integrated producer has added much automatic equipment or if he has a particularly efficient work force, he will have a proportionately low direct labor charge and might suffer in renegotiation if the Board applies the value added theory anywhere along the line. In order to forestall this, it would be a good idea, where low labor charges and a high degree of integration exist simultaneously, to clearly document the reasons for the low labor figure and to pick up further credit in the renegotiation analysis for high efficiency and plant investment.

Are Costs and Profits Reasonable?

The Board considers next the factor of reasonableness of costs and profits. From the cases which have gone to the U. S. Tax Court under the 1951 Act, it would appear that this factor is the most important one to the Board in cases in which it contends that excess profits exist. Under this factor the military renegotiation regulations provide that, when Government demands enable the contractor to increase his sales without exceptional effort and without corresponding increase in costs, decreased unit costs should result and the Government should normally receive the principal benefit in more favorable prices or in renegotiation. Since the regulation seems to assume that increased volume automatically

assures decreased unit costs, there is strong evidence that the Board has assumed excess profits in every case where government demands can be shown to have increased a contractor's sales without exceptional effort.

The safest way to act in such a case is to expect the challenge and to prepare strong arguments to make it clear that the Government has received the principal benefit of the increased sales, either by showing decreased prices or, if the case warrants, by showing that decreased unit costs did not result, for good and just cause. An example of the latter argument is the case of a contractor who doubles his sales within (say) a six month period or other limited time. Such a rapid increase does not occur and cannot be expected to occur without a more rapid rise in costs than happens when a slow and steady sales rise is taking place. Well documented arguments such as this should be clearly brought to the Board's attention.

It is under this same factor that the Board has been attacking executive compensation, particularly in closely held corporations. If there have been extraordinary bonuses or a rapid rise in executive compensation, paralleling an increase in government business, it is a good idea to document thoroughly the duties and working hours of each executive. Add to this a comparison of the compensation paid other executives in similar positions. If this material is brought together during the year in question, it can be made much more convincing as an argument than if it is quickly worked up as an after-thought. It is worthwhile to keep in mind at all times that arms-length negotiation of salaries is a very convincing proof of reasonableness.

The crux of this whole cost and profits factor is the word "reasonableness." It is a quality which cannot be determined but must be negotiated. The negotiator with the better set of facts will usually find himself with the better part of any agreement reached by negotiations.

Risk Assumed by the Contractor

The next factor considered by the Board is that of extent of risk assumed. Again looking at the record of the cases which have gone to the Tax Court, it may be said that the Board has considered this factor to cover primarily the risk assumed by close pricing. It has been the Board's contention that no risk has been assumed if there have been no price reductions to accompany increasing volume, if there has been a refusal to accept a price redetermination article, or if prices are competitive but the contractor's development costs have been absorbed in past periods. The factor under consideration does not consider the reasonableness of price but only the risk assumed by selling at that price.

Price reductions made in bidding on larger quantities involve a risk in that they anticipate cost reductions, which are by no means a certainty. As to the second point, accepting price redetermination assures the Government that the final price will be reasonable with respect to the cost but on the other hand, it has been shown that accepting a fixed price contract without price redetermination involves taking added risk, at least in times of rising price levels. The final argument, i.e., that on the absorption of development costs, should have no bearing on the price at all. The developer of a novel idea has a right to a continuing return on that idea, regardless of how the cost of development was handled from an accounting standpoint. Nevertheless, if the development costs have been written off previously, the contractor has a cushion which does reduce his pricing risk to some extent. It is this reduced risk that the Board is bringing up for consideration.

In preparing the company's arguments for renegotiation, it is always a good idea to be able to present valid reasons for not accepting price revision articles and for not reducing prices, keeping in mind at all times that it is the element of pricing risk that is considered by the Board.

Factors of Defense Contribution, Capital, and Efficiency

Contribution to the defense effort is the next factor to be considered by the Board, followed by the factor of capital employed. Both of these seem to be relatively unimportant by themselves in the renegotiation process. Most firms with enough government sales volume to be really concerned with renegotiation have made continuing contributions in the form of product and process improvements. Some have even developed novel ideas. However, it is only very occasionally that a contractor makes such a discovery or contribution to the defense effort as to be given extraordinary consideration for that alone. This does not mean that each contractor should not document his own contribution. He should, if only to show that he at least did his part.

While the contribution factor is pretty much neutral unless proven decisively in the contractor's favor, capital employed as a factor is generally neutral unless proven against the contractor. This is to say that the majority of contractors have supplied their own capital for defense operations. A few have relied wholly on government furnished facilities and they receive little renegotiation recognition for that. Capitalwise, there is a questionable area of advance and partial payments with respect to which the Board is likely to contend that the Government has financed the contractor. However, if the contractor can show that these payments are the same as payments normally received in commercial practice, he should not suffer for them.

Last of all the Board looks at the efficiency of the contractor. By this time, the contractor's well thought-out arguments for his efficiency have either been discounted by the fact the Government was responsible for the large volume of producion which brought it about or have been disproven by unreasonable costs. One might think from this that it is useless to set forth arguments for efficiency. However, a really good example of efficient operation often means the difference between a refund of profits to the Government and a clearance. It can turn the scales. One well-known contractor has been allowed to keep a very respectable percentage of his sales dollar each year, merely by showing that his efficiency was higher and his costs lower than competitors with the same prices.

Careful Preparation of Company's Case Necessary

All in all, renegotiation in 1954 will change only in degree. The amendments tacked onto the extension of the 1951 Act will tend to reduce the number of cases and to upgrade the quality of arguments to come before the Board. Nevertheless, it has always been true, and remains so, that each and every contractor can get his fair "break" from the Renegotiation Board if he will take the pains to bring together substantiation to show that profits earned are not excessive. The preparation of this should follow the six factors spelled out in the law, taking into consideration the treatment given these factors by the Board up to this time. Experience has shown that this approach has been very satisfactory in justifying earnings before the Board.

Process Costing of Shell Manufacture

by

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Step-by-step description of the working of departmental costs into unit costs in the special situation of processing of 105 MM shells (with a certain degree of relevance to other process costing situations) characterizes this article, which contains, as well, helpful industry background. Illustrative figures are carried through the paper.

THE PROCESS COST ACCOUNTING PROCEDURE which was designed for our company contains all of the details essential for proper cost control of a process manufacturing operation. It was devised in response to the vital interest of company management in cost performance on the production of 105 MM shells and the usual government restrictions which necessitated close and careful control over all phases of cost incurred in the production process. The principles applying to cost control of the manufacture of shells, as evidenced by this procedure, have direct application to process manufacturing of any repetitive, mass produced product.

During manufacture shells are in a continuous flow without reference to specific orders or lots. It is a process and calls for a process cost accounting system. Since costs are not collected in terms of specific individual jobs, process costs are in reality daily, weekly, or monthly average costs. Our costs for the shells are monthly average costs developed from the totals of all material, labor and actual burden accumulated on a departmental basis. Each department is charged with the direct material used, direct and indirect labor, and actual factory burden. The shell line is divided into two production departments and one service department. They are the forge department producing rough forgings, the machining department, producing finished shells, and the tool grinding and maintenance department. The purpose of the process cost system and accumulating costs on a departmental basis is so we may determine the total and unit costs of production for each department for each month.

Forge Department Operations and Production Reports

The forge department is the first of the two production departments in production line sequence. This department starts with the bars of billet steel and converts it into rough forgings by processing it through the following operations.

Nicking
Breaking (at this point, the material is called a slug.)
Rotary forge furnace
Descaling
Piercing press
Draw press
Retarded cooling conveyor

As the material comes from the cooling conveyor, the final operation, it is inspected and, if accepted, it is a rough forging and the completed product of the forge department. In order to determine costs for the forge department, we must have a detailed report from the production department. This report is prepared on a monthly basis and gives the quantity of units in process at the first of the month, units started in production during month (number of units broken at the billet breaking press), less units inspected and accepted during month and less units lost or spoiled, to give units in process at the end of month. It accounts for all units from the billet breaking press through the cooling conveyor.

The report must be in balance as to quantity, that is, the units in process at the first of the month, plus all the units started during the month are the total number which must be accounted for as completed and accepted units, units in process at the end of the month, or units lost or spoiled.

It has been our experience in the past that some of the units identified as lost or spoiled include rough forgings rejected for some minor defect. This material is not to be sold as scrap but accumulated and, at some later date, re-run through the forge department to make an acceptable forging. It is absolutely necessary that the report show any such item separately and show also a detailed description or explanation as to the ultimate disposal.

Since the Government requires that all scrap accumulating from performance of contracts must be credited to the process at the current scrap value, regardless of whether or not it is sold, the production department must also furnish a detailed report of the accumulated scrap in the forge department on a monthly basis. This report must contain the weight of all crop ends (the pieces of steel on the end of a billet bar that are too short to produce a forging), spoiled forgings, "mill scale" scrap (the accumulated scale as a result of the descaling operation), and the weight of any other accumulated scrap, in the event that some unforeseen difficulty arises, such as breaking slugs too short or producing forgings temporarily rejected.

It is likewise necessary to obtain from the production department the quantity of any direct material on hand at the end of the month, requisitioned but

END OF MONTH REPORT-FORGE DEPARTMENT

Billet stock issued but not used as of the end of month		129,208 lbs.
Units in process-first of month		55,293
Put into process during month		63,676
Completed and transferred		18,734
Work in process-end of month		98,311
Lost or spoiled in production (includes 23 short cavity forgings)		1,924
Weight of lost or spoiled forgings and any other scrap accumulated in forge department:		
1. Steel scrap #12		
Short cavity forgings	Gross tons	.41
Other forgings	Gross tons	33.95
Crop Ends	Gross tons	22.19
Total	Gross tons	56.55
2. Steel mill scale	Gross tons	8.87

EXHIBIT 1

not acutally started in production. In the forge department this will cover billet steel only, as it is the only direct material used. All of the foregoing information required from the production department has been satisfactorily incorporated in one report entitled End of Month Report illustrated (forge department section) in Exhibit 1.

The Cost Report of the Forge Department

From the information reported and from the departmental cost account records, we have the data necessary to proceed in determining the total and unit costs of production for the forge department for the month. This is done by means of a departmental cost of production report (Exhibit 2). In connection with the departmental report, there are two special considerations to become familiar with.

The first is equivalent production. In producing shells, we are manufacturing a single product on a production line basis. As already said, the completed unit in the forge department is the rough forging. At the end of each month, not all of the units started in production during the month will be completed. Some will remain in an unfinished stage all along the production line. To determine the unit cost of the work done, it is, therefore, necessary to convert the unfinished work to its equivalent finished production. This may be defined as the number of units which would have been completely finished had the cost expended upon both the finished and unfinished units been applied only to wholly finished units. The second point relates to the treatment of spoilage. Losses due to spoiled work are production costs and should be charged to the process through the burden account. Therefore, we calculate the costs of spoiled units

as to material, labor, and burden, credit in-process, and charge the forge department spoilage account.

The necessary bookkeeping for forge department costs involves material used, labor, and burden accounts with all material, labor and burden consumed during the month, followed by credit to the material used account for the cost of billet steel issued but not used as of the end of the month, credit to the same account for the scrap value of all accumulated scrap not due to spoiled work (mill scale and crop end scrap), and credit to the material used, labor and burden accounts for the cost of the spoiled units, with charge to the burden account for this cost. This latter charge is partly offset by credit to the burden account for the scrap value of the spoiled units. Finished units are then transferred by charge to stores inventory and are credited to material used, labor and burden accounts. After these entries have been made, the remaining cost in the departmental cost account will be the value of the in-process inventory.

It is this inventory which must be converted to equivalent production in order to establish unit costs for the department. As to material, the work in process in the forge department is complete, since the "slug" is the only material used in producing a rough forging. Hence, the equivalent production as to material in the forge department would be as follows:

Units completed and transferred	18,734
98,211 units in process—100% complete	98,311
Equivalent production as to material	117,045

To determine the equivalent production as to labor and burden, it is first necessary to place a value as to labor cost on the units in process. This is accomplished by using the labor cost standards table which sets forth the standard labor cost per operation. At the end of December, the 98,311 units in process were all slugs, that is, they had been through only two operations, the nicking and breaking operations. The forge department was operating on a two-shift basis and, by referring to our labor cost standards, we find that the average standard labor cost for these two operations is $3.3088 per 100 units, or $.0331 per unit. Therefore, 98,311 units at this price equals $3,252.91, the approximate value of labor on the units in process. By referring to the departmental cost records, we find that the labor in process at the beginning of the month was $1,859.04, and that labor of $12,480.18 was added during the month, a total labor cost of $14,339.22. This is the total amount of labor expended on wholly finished units, partly finished units in process, and spoiled units. We have established that the labor expended on the units in process to be approximately $3,252.91. It follows that the labor on finished and spoiled forgings was $11,086.31. ($14,339.22 minus $3,252.91).

COST OF PRODUCTION REPORT FOR FORGE DEPARTMENT

	Material	Labor	Burden	Total	Equivalent production
Work in process first of month: 55,293	145,416.40	1,899.04	4,758.39	152,033.83	
Added during month 63,676 units	180,154.63			180,154.63	117,045
Added during month		12,480.18		12,480.18	24,515
Added during month			44,462.54	44,462.54	24,515
Cost of spoiled units 1,924	(4,927.94)	(541.49	(732.27	(6,201.62)	
Less: Mill scale and crop ends	(855.18)			(855.18)	
Total departmental cost	299,787.91	13,797.81	48,488.66	362,074.38	
Unit cost	2.5613	.5628	1.9779	5.1020	
Transferred to inventory: 18,734 units	47,983.39	10,543.50	37,053.98	95,580.87	
Work in process: 98,311 units	251,804.52	3,254.31	11,434.68	266,493.51	
Total departmental cost	299,787.91	13,797.81	48,488.66	362,074.38	
Unit value of work in process	2.5613	.0331	.1163	2.7107	

EXHIBIT 2

Since we have had no way of determining at what point in the production line a unit was declared spoilage, we consider that the spoiled units average 50 per cent complete as to labor and burden. If the labor expended on 1,924 spoiled forgings had been on acceptable forgings, we would have completed 50 per cent of them or 962 additional forgings. By adding this figure to our finished production of 18,734, we have an equivalent production figure covering finished and spoiled forgings of 19,696 and we know the labor expended on these units is $11,086.31. By dividing the total cost by the equivalent production, we find the unit cost as to labor is $.5628. We have already established that the units in process have a labor cost of $.0331 each. By dividing this by the total labor cost of $.5628, we find the units in process are 5.88 per cent complete as to labor. The equivalent production as to labor and burden is then figured as follows:

Units completed and transferred	18,734
98,311 units in process, 5.88% complete	5,781
Equivalent production as to labor and burden	24,515

By referring to the end of the month production quantities report, we see that a total of 22.19 gross tons of crop ends and 8.87 gross tons of mill scale were accumulated during the month. The material used account must be credited with the scrap value of this scrap, which is computed as follows:

8.87 gross tons mill scale @ $4.00	$ 35.48
22.19 gross tons crop ends @ $36.94	819.70
Total scrap value	$855.18

We then credit forge department material used and charge stores inventory for $855.18.

Our next step is to figure the cost of spoiled units by elements. By referring to departmental cost records, we find that the material cost of units in process at the beginning of the month was $145,416.40. The cost of all units added

during the month after the cost of material issued but not used was credited, was $160,154.63 and the scrap value of accumulated scrap was a credit of $855.18. This is a total material cost of $304,715.85, which represents all the completed units, all the units in process, and all the spoiled units. Therefore, the equivalent production of the finished and unfinished units of 117,045 plus 1,924 spoiled units is a total of 118,969 units represented by the $304,715.85 material cost. By dividing this cost by the units, the material unit cost of each unit, regardless of whether it is finished, in process, or spoiled, is $2.5613. Then the material cost of 1,924 spoiled units is $4,927.94.

As previously stated, the spoiled units are considered 50 per cent complete as to labor. We also found that the total labor cost was $.5628 per unit. Half of this is $.2814, the amount of labor on each spoiled unit. This gives us a total of $541.41 labor on the spoiled units.

We must know the total burden cost for the month in order to determine the burden cost per unit. However, since the total cost of the spoiled units is to be charged to the burden account, we must know the cost of spoiled units before we can determine the total burden. For this reason, we have established a policy of using the previous month's departmental burden rate to figure the burden cost of spoiled units. The burden cost for the previous month was $.7612 per unit and, since the spoiled units are considered 50 per cent complete as to burden, we apply burden at a rate of $.3806 per unit, which gives a total of $732.27 burden on spoiled units.

We then credit the forge department material used $4,927.94, labor $541.41, burden $732.27 and charge forge department spoilage $6,201.62 as the cost of 1,924 units lost or spoiled in production during the month.

Our next step is to remove from the forge department spoilage account the scrap value of these spoiled units. From the end of month report, we see that the accumulated scrap from the 1,924 spoiled units is 34.36 gross tons, including 23 short cavity forgings which weigh .41 gross tons. Since we desire to accumulate the short cavity forgings separately, as they may later be disposed of at more than their scrap value, we have set up a special stores inventory card for them. However, at the present time, they are worth only their scrap value. We credit forge department spoilage with 34.36 gross tons scrap (Grade #12) @ $36.94 per gross ton, $1,269.26, and charge stores inventory-scrap $15.15 for 23 short cavity forgings (.41 gross tons) and $1,254.11 for 33.95 gross tons grade #12 scrap.

We now assemble the foregoing figures in the form of the cost of production report, with the results shown in Exhibit 2, already mentioned together with the resulting units. On the books, we credit forge department material used $47,-

END OF MONTH REPORT-MACHINING DEPARTMENT

Units in process-first of month	11,214
Put into process during the month	70,573
Completed and transferred (number of units palletized during month)	64,682
Work in process-end of month	13,773
Lost or spoiled in production	3,332
Material issued to machine line but not used	
Direct material	
Rotating band blanks	2,495 pieces
Base plates	2,613 pieces
Olive drab paint	68 gallons
Acid proof black paint	40 gallons
Packing and crating material	
Barrier paper	159 sheets
Paper sleeves	3,093 pieces
Steel banding tape	1 roll
Galvanized wire	3 rolls
Connectors	2,364 pieces
Scrap data	
(Weight of turnings, scrap shells, and any other steel scrap acumulated in the machine lines.)	
A. Steel scrap #12	122.93 gross tons
B. Steel scrap #6	-0- gross tons
C. Steel scrap #23	379.50 gross tons
Weight of spoiled bands and brass turnings recovered	16,790 pounds
Quantity of spoiled bands accumulated	1,831

EXHIBIT 3

983.39, labor, $10,543.50, and burden $38,053.98 and charge stores inventory—105 MM rough forgings $95,580.87. The forgings remain in stores inventory until they are needed by the machining department, at which time, they are withdrawn on a material requisition and charged to the machining department as material used.

Machining Department Operations and Costing Bases

Through approximately 24 operations using 54 machines, the rough forging is converted into a finished shell. These operations in the machining department are as follows:

- Grind boss
- Center boss
- Rough turn shell
- Cold nose open end
- Heat treat (harden, quench in oil, draw to correct hardness)
- Thread nose
- Knurl band seat
- Notch nose
- Rough grind bourrelet
- Finish grind bourrelet
- Press on rotating band
- Shot blast cavity
- Bore face and chamber nose
- Finish turn shell and rough band groove
- Groove band seat and recess
- Finish turn band
- Weld on base plate
- Stamp shell
- Wash and phosphate
- Paint
- Package or palletize shell for shipment

Material, labor and burden are accumulated on a departmental basis as in the forge department and the same type of production reports and departmental

cost reports are required. However, in the machining department, we have more than one kind of direct material, defined as material which becomes a part of the finished shell. This material includes and is limited to rough forging, metal rotating band, metal base plates, and paint (outside and inside). The costs of these materials are accumulated in the machining department material used account separately, so that the total and unit cost of each type of material may be determined. The equivalent production is figured separately as to forgings, bands and base plates. The actual number of shells painted is used for consumption of paint.

The labor for the machining department is accumulated and figured on the entire process basis rather than by operations. This is the same method as used in the forge department and the equivalent production as to labor is figured in the same way.

The departmental burden account for the Machining Department includes the cost of the materials used in palletizing the shells. These items are pallet, corrugated sleeves, greaseproof barrier paper, steel banding tape, connectors for banding tape, and galvanized banding wire. The cost of material used for palletizing is accumulated in the packing and crating material account. The total unit cost for palletizing material is then figured as a separate item of the machining department burden. This total and unit cost is shown separately on the machining department cost of production report. The actual number of units palletized is used to figure the unit cost. The remainder of the burden in the machining department is treated in the same manner as the forge department burden. The equivalent production is the same, in principle, as for labor.

Production Reports from the Machining Department

The same types of reports are needed for the machining department as were needed for the forge department. However, in the machining department, we require more information, although the section of the end of month report pertaining to quantity of production is the same for both departments. Machining department figures are shown at the top of Exhibit 3. In the forge department, we needed to know the amount of billet steel issued but not used as of the end of the month, so that this material could be credited to the material used account in order not to overstate the material cost of completed units for the month. The same is true for all direct material and packing and crating material in the machining department.

This information is furnished by the production department and is exemplified by the second section of Exhibit 3. The production department must also fur-

COST OF PRODUCTION REPORT FOR MACHINING DEPARTMENT

	Material	Labor	Burden	Total	Equivalent production
Work in process first of month: 11,214	37,953.10	2,592.66	5,993.79	46,539.55	
Less bands and base plates	(457.51)			(457.51)	
Net value of forgings in process first of month	37,495.59				
Added during month, 70,573 units	265,640.79			265,640.79	
Less: cost of spoiled units: 3,332	(11,791.61)	(1,365.79)	(2,487.84)	(15,645.24)	
scrap value of turnings	(13,702.66)			(13,702.66)	
Net value of forgings	277,642.11				78,455
Rotating bands	23,416.50			23,416.50	65,395
Base plates	849.14			849.14	65,318
Paint	1,770.61			1,770.61	64,682
Palletizing			6,919.83	6,919.83	64,682
Direct labor		54,072.97		54,072.97	67,457
Burden			181,680.90	181,680.90	67,457
Total manufacturing cost	303,678.35	55,299.84	192,106.63	551,084.82	
Unit costs:					
Forging	3.5389			3.5389	78,455
Band	.3581			.3581	65,395
Base plate	.0130			.0130	65,318
Paint	.0274			.0274	64,682
Palletizing			.1070	.1070	64,682
Labor		.8198		.8198	67,457
Burden			2.7418	2.7418	67,457
	3.9374	.8198	2.8488	7.6060	
Transferred to inventory, 64,682 units	254,678.91	53,028.30	184,265.08	491,972.29	
Work in process, 13,773 units	48,999.45	2,271.54	7,840.60	59,113.59	
Total departmental cost	303,678.35	55,299.84	192,106.63	551,084.88	
Unit value of work in process	3.5576	.1651	.5693	4.2920	

EXHIBIT 4

nish information as to the amount and kind of all accumulated scrap for the month, so that the proper material used or spoilage accounts may be credited with the scrap value. This section of the end of month report appears at the bottom of Exhibit 3.

The accumulated scrap report for the forge department gave us separately, the amount of scrap due to spoilage and the amount not due to spoilage, as the scrap value of accumulated scrap due to spoilage had to be credited to the burden account and the other scrap credited to the material used account. However, the machining department "steel scrap #12" includes the weight of the spoiled units and other scrap not due to spoilage. Since it is impracticable from a production viewpoint to separate this scrap, we calculate the weight of spoiled units, based on an arbitrary weight of 26 pounds per spoiled unit. The Grade #12 scrap is then broken down as follows:

Scrap due to spoiled units, 36.68 gross tons (scrap value to be credited to the burden account.)

Scrap not due to spoiled work, 84.25 gross tons (Scrap value to be credited to the material used account.)

The same problem arises in regard to the brass scrap. Since part of this scrap is the weight of spoiled bands, the cost of which is charged to the burden account, we must break this total weight into two parts, the weight of spoiled bands and the weight of brass turnings. To accomplish this, we use .7061 pounds as being the weight of each spoiled band. The total brass scrap is then broken down as follows:

Spoiled band blanks	**1,294 pounds**
Brass turnings	**15,496 pounds**

The scrap reported as "Steel Scrap #23" is the total of all steel turnings, and this scrap value is credited to the material used account.

We need one additional report from the production department covering the machining department in-process inventory. This detail of the in-process inventory is used in determining the labor cost on the units in process. It must show the last completed operation of each unit in process. From the labor cost standard table, we take the accumulated labor by operations and calculate the value of labor on the units in process. This calculation for the month of the report is as follows:

LAST COMPLETED OPERATION	QUANTITY	ACCUMULATED COST PER 100 UNITS	LABOR VALUE
Rough turned	5,314	$10.4933	$ 557.61
Cold nosed	878	11.8741	104.25
Heat treated	517	15.1806	78.48
Shot blasted	5,857	16.5176	967.44
Nose bored	59	24.0265	14.8
Finish turned	9	30.7551	2.77
Boss sheared	22	31.3781	6.90
Band seat	283	35.7779	101.25
Nose threaded	13	38.8237	5.05
Stamped	10	52.3015	5.23
Bourrelet finish ground	108	41.7895	45.13
Banded	28	45.4705	12.73
Bands turned	49	49.5410	24.28
Base plates welded	95	51.3815	48.81
Phosphatized	263	55.4560	145.85
Painted—not palletized	268	57.9084	155.19
	13,773		$2,275.15

Cost Reports of the Machining Department

From the foregoing reports and the departmental cost records, we have all the information necessary to determine the cost of production for the month. The Cost of Production Report for the machining department for the same month is shown as Exhibit 4.

As indicated before, the equivalent production for the machining department is figured separately for each type of material used and for labor and burden. The forgings in process are complete as to material costs. Therefore, the equivalent production is figured as follows:

Units completed and transferred	64,682
13,773 units in process, 100% complete	13,773
Equivalent production—forgings	78,455

Before figuring the equivalent production as to shells banded, we determine the quantity of bands lost or spoiled during the month. The production department gives us the quantity of spoiled bands accumulated during the month, but this is not necessarily the actual number lost or spoiled. We can determine the number of banded shells in process at the end of the month from the detail of in process inventory. All shells past the banding operation have bands on them. This quantity for the month was 713. From departmental cost records, we find that a total of 68,463 bands were issued during the month and that 1,260 banded shells were in process at the beginning of the month. The number of bands lost or spoiled is then figured as follows:

Banded shells in process at start	1,260
Bands issued during month	68,463
Less: bands issued but not used	2,495
Total bands available	67,228
Used on completed shells	64,682
Banded shells in process at end	713
Bands lost or spoiled	1,833

The equivalent production as to shells banded can then be figured as follows:

Used on completed shells	64,682
713 in process 100% complete	713
Equivalent production as to shell banded	65,395

The base plates are treated in the same way as bands. The quantity in process at the end of the month are all shells past the operations, "base plates welded on." The calculation as to base plates for the months was as follows:

Base plates on shells in process at start	1,047
Base plates issued during month	86,171
Less: base plates issued but not used	2,613
Total base plates available	84,605
Used on completed shells	64,682
Base plates on shells in process at end	636
Base plates lost or spoiled	19,287

(This quantity of base plates lost or spoiled was considered very excessive, but after a careful and thorough check, it was found correct.)

The equivalent production as to base plates welded on can then be as follows:

Used on completed shells	64,682
636 in process 100% complete	636
Equivalent production	64,318

The equivalent production as to labor is figured in the same manner as in the forge department. Our total labor cost was as follows:

In process at start	$ 2,592.66
Labor for month	54,072.97
Total labor cost	$56,665.63

This total labor, less the value of labor on units in process, leaves $54,390.48 expended on 64,682 completed units and 3,332 spoiled units. Again we consider the spoiled units as being 50 per cent complete as to labor and burden. Thus, had the labor expended on spoiled units been on good units we would have completed an additional 1,666 shells, a total of 66,348 at a labor cost of $54,390.48. This gives a unit cost for labor of $.8198. The labor on 13,773 units in process was $2,275.15, a unit cost of $.1652. As a consequence, if the unit cost of labor on shells in process is $.1652 and the total unit cost of completing a shell is $.8198, the shells in process are 20.15 per cent complete. Equivalent production as to labor and burden is then figured as follows:

Completed and transferred	64,682
13,773 units in process, 20.15 per cent complete	2,775
Equivalent production as to labor and burden	67,457

A summary of the entries required for the machining department will indicate how the cost figures are used on the books. The departmental material used, labor and burden accounts are charged with all materials, labor and burden used or consumed during the month. The departmental material used accounts are credited with all material issued but not used as of the end of the month and with the scrap value of all accumulated scrap not due to spoiled work. The costs of all spoiled units, including spoiled or lost bands and base plates, are credited to material used, labor and burden, and charged to spoilage, which is then credited with the scrap value of all spoiled material. It is possible then to transfer the cost of completed shells from the material used, labor and burden accounts to stores inventory.

Underlying Cost Data; Service Departments

The production and cost reports for the forge and maintenance departments, already illustrated, together with description of cost entries made, forms a rounded picture of our process costing system, including cost accumulation and unit costs. There remains to be given, briefly, an indication of cost accumulation procedure at the factory level and a note, also brief, on service department cost

as a part of burden. All direct materials, packing and crating materials, cutting and forging tools, cutting and forging compounds, grinding wheels and the more expensive items of operating supplies are put first into stores inventory. They are withdrawn by material requisitions showing exactly what is being withdrawn and where it is to be used and charged. The other operating supplies, cleaning materials and maintenance and repair materials are charged to the department in which they are intended to be used, at the time the invoices are paid. The material used charge for direct material is the accumulation of requisitions issued during the month. Labor cost is accumulated by the payroll department on a special shell department labor distribution.

Factory burden expenses are charged to the burden accounts either by journal voucher or direct charges from paid voucher. After the total burden cost for each department has been determined, the expenses of the tool grinding and maintenance department are prorated as additional burden to the operating departments, 70 per cent to the machining department and 30 per cent to the forge department. In addition to the three departments that are engaged solely in producing shells or servicing shell department equipment, there are several departments that serve both shell and commercial departments. The expenses of these departments must be allocated to all the production departments they serve. The expenses of the compressed air department are prorated on a basis of compressed air requirements per shift for shell and commercial use, and number of shifts operating. The proration rate for the personnel department is based on the number of production personnel in each department. The material purchasing and control department, which has the functions of purchasing, receiving, handling, controlling, issuing and costing all direct and indirect materials and supplies, was studied and it was decided to pro-rate its expenses half to the commercial departments and a quarter each to the machining and forge departments.

How A Super Market Chain Started Budgeting

by LLOYD D. TARLIN

Vice-President, Stop & Shop, Inc., Boston, Massachusetts

The initiation of a budget program is a critical stage with regard to its future standing and usefulness, especially in a company and industry where it remains a pioneering type of technique. How, in one food company, the installation of a budget was accomplished with adequate backing and adequate internal publicity and indoctrination is described in this article.

BUDGETING IS COMPARATIVELY NEW in my company. Our first plans were completed less than two years ago. To afford better understanding of what our problem was and how we approached it, I would like to briefly outline the nature and size of our company and operations and to describe the problems we had to face in planning the budget program. The presentation will then go on to the adoption of the program and the results.

Stop & Shop operates 94 super markets in Massachusetts and Conecticut. Our annual volume is currently over $80,000,000 and we employ 3,000 full-time and part-time people in our stores, warehouse, bakery and general office. Our stores vary in size from a small store with few employees to our largest super market employing several hundred people. Our profit rate, which is typical of the industry, was 1¼ per cent of sales for our latest fiscal year. It is obvious that operations at such a close margin must have very close controls. Our company operations are, roughly, divided into four general areas:

1. Sales planning—the control of purchasing, sales promotion, gross profit markup and advertising.
2. Stores operation—execution of sales plans and control of expenses at the store level.
3. Warehouse and distribution—serving the stores with their requirements.
4. General administrative and other services—all other general office functions and services performed for the stores.

The Control Situation of the Retailer

We are not in the position of a manufacturer who can plan his production schedule in advance, because ours is a service business involving large quantities of perishable products. These are ordered by the stores, purchased, shipped and sold within 24 hours. Our volume fluctuates by days of the week. Seventy-five per cent of the week's business is done the last three days. A hot, muggy weekend or a stormy weekend will seriously affect volume. An aggressive promotion will stimulate sales. Thus, cost control must be planned carefully. Gross profit

OUTLINE OF BUDGETING PROCEDURE

Step 1. Data to be furnished to the divisions

	Data	Source
a.	Last year's experience for period to be covered.	Accounting department
b.	Overall tonnage goals for existing stores.	General manager
c.	Store expansion and renovation plans, including target dates.	General manager
d.	Commodity price forecast.	Market research department

Step 2. Preparation of divisional budgets

a. Each division head shall submit on schedule to the chief budget officer budget figures broken down by department and by account classification as listed on a standard budget form. (Exhibit 2). An appropriate text, explaining the bases for the budget projections, is to accompany the form when submitted. The budget figures, for the present, shall be on a quarterly basis. Sales, gross profit, salaries and wages, shall be further broken down by 4-week periods.

b. The chief budget officer shall review the divisional budgets, consolidate them into an overall company budget and submit it, with adequate explanatory text, to the general manager.

Step 3. Approval of Budget by General Manager

a. The general manager will review the budget and text and will indicate such modifications of plans as he deems advisable.

b. The approved budget shall be presented to the division heads at a special meeting, chairmanned by the general manager.

Step 4. Evaluation of Results Versus Plans

a. Each division head shall prepare and submit to the chief budget officer a review and evaluation of the division's results versus plans, on a 4-week and quarterly basis.

b. The chief budget officer shall prepare a consolidated review and submit it to the general manager, who, after studying it, will indicate what adjustments and action are to be taken to achieve desired goals. The general manager will choose the time and means for conveying his views to the division heads.

EXHIBIT 1

is the result of the sales promotion of several thousand commodities which have varying markups and are placed on display where the customer makes her own selection.

The principal problem which we faced was that, in the absence of a coordinated company plan, divisional plans could not be integrated and, hence, earnings might fluctuate sharply. Without specific goals, there was no target for each operation and the effect of a change in conditions in one section was not compensated for elsewhere. Operating results, published every four weeks and issued about two weeks after the period close, inspired corrective action too late. Our problem has been further aggravated in the past two years by a level or declining price index for the food we sell and increasing cost for wages and other services purchased. It was to meet this problem, viewed

as a whole, that we decided to establish budgetary control and appointed a budget advisory committee to recommend a plan. Members of the committee visited other food chains to take advantage of their experience to guide our thinking. The report which was prepared was short and, since it illustrates much of what we are trying to accomplish, its principal contents form the substance of the remainder of this article.

The Report of the Budget Advisory Committee

The report consolidated all memoranda previously submitted and introduced new material on procedure for implementing budgeting. It pointed out that proper implementation of the program should yield very substantial rewards in earnings and security for the company, as well as greater opportunity for self-development and achievement for every level of management. It then dealt with company objectives and stated that the major objective of the company is to earn an adequate and continuous profit, based upon an acceptable predetermined standard—in this case, the ratio of profit before Federal income taxes to capital investment in the business. The long-range aim was further identified as the achievement of an orderly expansion program designed to offset (or reduce) rising direct and indirect costs.

As an additional tool for its long-range objectives, the company was stated to be ready to use budgeting to enable management to pursue its endeavors with the promise of greater success and less human wear and tear. However, the report included the warning that budgeting, like any other tool, yields results commensurate with the skill of its user and reminded all company personnel that they would have to devote effort to master the use of this tool. The services of the chief budget officer were offered to all to master the art of budgeting. Confidence was expressed that, since the executives had already evidenced enthusiasm for budgeting and had unanimously endorsed its adoption, the program would be a success.

The report went further into fundamentals and described planning, coordination and control as the three pillars on which budgeting rests with each pillar indispensable to the existence of the budgeting edifice. Budgetary planning was set forth as the development of an integrated overall company program sufficiently in advance to permit orderly, scheduled action. Budgetary coordination was represented as calling for group effort and for the promotion of teamwork to accomplish the company program, requiring also that strengths and weaknesses which show up in the program be promptly recognized and analyzed. Budgetary control was described as the measurement of performance against

BUDGET FORM

DIVISION_____ DEPARTMENT_____ PERIOD FROM_____ TO_____

	Last Year Actual		This Year's Budget		This Year's Actual		Variation	
	(col. 2a) Period	(col. 2b) Quarter	(col. 3a) Period	(col. 3b) Quarter	(col. 4a) Period	(col. 4b) Quarter	(col. 5a) Period	(col. 5b) Quarter
Account (col. 1)	The account names (col. 1) and last year actual (col. 2a and 2b) will be completed on the Budget Forms that the Division receives.							

Instructions on the Use of the Budget Form

1. Make budget estimates in duplicate for each account listed on the attached Budget Form for your division. Complete columns 3a and 3b. Retain original and send duplicate to the Chief Budget Officer, and append an appropriate text explaining bases for budget projections.
2. At the end of each 4-week and quarterly periods complete the appropriate columns (4a and 4b; 5a and 5b) on the original in your possession; the Chief Budget Officer will make identical entries on the duplicate copy in his possession.
3. Use these data as the basis for your memorandum to the Chief Budget Officer regarding Results versus Plans.

EXHIBIT 2

projections, including analysis and interpretation of variations and initiation of remedial action wherever necessary.

The report assigned responsibility for budgeting to all levels of management, each for the operations involved. To the general manager was given the task of setting the overall goals for the company. Specific goals for each company unit were then to be developed as a component part of the overall goal and submitted by each level of management. The chief budget officer was charged with the assistance of the budget advisory committee, as needed, to consolidate all divisional budgets and performance reports for presentation to the general manager, so that he could review them and indicate such modification of plans and action as might be necessary to achieve the desired overall goals.

The setup was formalized by making the controller chief budget officer, with the budget advisory committee performing the following functions with respect to the budgeting program: recommending budgetary procedures and assisting the chief budget officer to install the budgeting program, to review the budget material which is to be submitted to the general manager, and to deal with special problems. The budget advisory committee and the chief budget officer were made responsible to the general manager, in their tasks.

An outline of the procedure established appears in Exhibit 1 and embodies the conviction that accounting policy must be reasonably consistent to set up proper benchmarks for planning and control. This further requires that all costs must be classified in a uniform manner and in accordance with the chart of accounts. Required changes in accounting policy and in the chart of accounts must coincide with budget planning periods and must be announced

in advance, with major changes effective, preferably, at the beginning of a fiscal year. It was decided that the chart of accounts should be reviewed by the chief budget officer with each division head to make sure that complete understanding and information were available for planning and control in each division and that all the necessary, basic statistical data should be developed under the direction of the budget advisory committee.

A Better Forward Look

It will perhaps be helpful to reemphasize in conclusion that our plan is based on budgeting or planning by responsibility and that it is backed up by our accounting system, also organized by responsibility. We think the plan has worked well and that it has enabled us to accomplish several things. The following developments have taken place:

1. Setting forth the product mix results has highlighted weaknesses.
2. Corrective action could be (and was) taken in advance.
3. Each division head has striven to achieve the goal he had set.
4. Interest has developed in controlling expenses in areas often neglected before.
5. Team work has been stimulated in all divisions.

One of the keys to the success of our plan is the budgetary text which we require. We feel that the explanatory detail, submitted in advance and again as results versus plans, serves as means of divisional self-analysis and automatic action.

As a final point, it must be added that the problem of budgeting is never over. Plans for one period are due before the final results of the previous period are available. Problems arise in different areas each period. The budget ferrets out those problems, highlights them, and enables corrective action to be taken in advance.

You Don't Need to "Snowball" Burden in Costs

by PATRICK H. HUTCHINSON

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Under the practice here described—offered as a procedural simplification and an improvement in product costing—accumulated indirect costs at three levels are identified as components of operating and product costs. These levels are direct costs plus fixed costs attaching to physical facilities, full factory costs, and product costs inclusive of commercial burden.

DOES YOUR COSTING PROCEDURE pick up increments of burden and hide them, as a rolling snowball picks up more snow? It does not have to. This paper is in the nature of a report outlining the simplified system of distributing overhead, burden and fixed costs under job costing, adopted by an outstanding printing and stationery company. The system has been in operation in a modified form since July 1, 1953 and was introduced on the refined and expanded basis July 1, 1954. The company using the system has three divisions. Two of these purchase the majority of the items which they market. The third marketing department manufactures as well as sells its five lines of products. Its principal operations are printing, imprinting, lithographing, engraving and binding. It has ten manufacturing departments, which are subdivided into 35 cost centers using over 120 machines and employing about 200 people. The distribution involved amounts to about half-a-million dollars.

The job order system is used in conjunction with standard machine and man-hours rates for the cost centers. As is common in the printing and lithographing industries, the standards are based on "all inclusive costs per chargeable hour." With such a system, the distribution of the overhead, burden and fixed charges to the departments and cost centers takes on an added significance because the standard rates for this purpose become the basis for product pricing and estimating. The determination of gross and net profits from operations is directly dependent on the efficiency and accuracy of the system used and the information it supplies. The general accounting and cost systems interlock. Cost is transferred monthly on the general books from the work-in-process and inventory accounts to the cost-of-sales and variance accounts, by products, permitting the preparation of accurate operating, profit and loss, and cost reports.

Under the original cost system, the distribution of fixed expenses followed

more or less normal practice. Part of the expenditures were charged to the burden departments. From there, they were prorated to other burden departments, marketing and manufacturing departments. Then they were further prorated from the manufacturing departments to products. As a result of the reprorations of prorations, it was impossible to tell just how much burden or fixed expense was being carried by any manufacturing department, cost center or product. The refinement to which this paper is directed had the effect of eliminating the intermediate prorations and carrying the appropriate percentage of fixed expenses directly to the manufacturing departments and cost centers. Prior to the change only about 60 per cent of the fixed expenses borne by the departments and cost centers appeared as such, the remaining 40 per cent being buried in the distribution of the burden departments. Since the change, the entire amount of the fixed expense borne by any department or cost center appears as such on the monthly report.

The change which had the foregoing principal effect was made primarily to facilitate competitive product costing. It was recognized that to compete in a fluctuating market, beset with inflation, recessions and changing business conditions, the cost report should identify clearly three phases of cost for product costing purposes:

1. The direct cost to indicate the minimum selling price during temporary general recessions or the price at which idle time can be sold during a period of low demand. The direct cost includes the direct labor and direct expense plus the indirect expense variable with output.
2. The factory cost, to indicate the price to be used for inventory valuation, as in the case of items manufactured for later sale and delivery or for re-working to completion on customers' orders when they are received. The factory cost includes the direct cost plus the relatively fixed and burden costs which continue regardless of the current production volume.
3. The all inclusive cost, which represents the break-even point and the basis of the selling price under normal operating conditions. This cost includes the factory cost plus the order-getting, filling, and collection costs, both fixed and variable.

Budget-Estimates and Distribution Bases for Fixed Costs

The first refinement to original distribution procedure covered only fixed expenses. It was adopted on short notice, with the result that overhead ratios were used which were based on considerations of product value and area in which processed or stored, and on these only. However, the plan as applied has been very successful. Hence, it has been decided to continue it and to expand it to cover, not only fixed expenses but all burden department costs as well and to extend the overhead application percentage formula program beyond the manufacturing departments and cost centers to the final product costs. This called for a major budgeting operation which would produce the maximum in simplification and much reduction in the month-by-month posting and reporting operations. Concretely, it called for the estimating of the overhead and fixed expenses for the next twelve

months and the calculated distribution of these estimated costs and expenses to the end departments and cost centers which would benefit.

The first step was to determine how each type of cost should be distributed and to establish the distribution bases which would be required and used. The following bases were found to be necessary and each was carefully established, measured and recorded:

1. Valuation of land and buildings.
2. Valuation of machinery and equipment.
3. Total net valuation of all fixed assets.
4. The product of the chargeable hours at the standard hour.
5. Gross profit margin of each department and cost center before and after the addition and deduction of variances.
6. Percentage of materials (by weight) used by each department and cost center.
7. Inventory values maintained for use by each department and cost center.
8. Group insurance participation by the employees of each department and the equivalent company portion of the cost by departments.
9. Total payroll costs, direct and indirect, by departments and cost centers.
10. Working area in square feet occupied by each department and cost center.
11. Connected power load of each department and cost center.

With the bases of distribution determined and with the estimated amounts of costs and expenses approved, the next step was to distribute these costs using these bases. Fixed expenses were handled first. It was found that, under this heading, there were four different kinds of insurance, three different kinds of taxes and three different kinds of depreciation, plus building repairs, power and light, and heat, as follows:

Item	Distribution basis
1. Group insurance	Employee participation
2. Insurance on buildings and machinery	Net asset valuation
3. Insurance on contents of buildings	Inventory values
4. Use and occupancy insurance	Gross profits
5. Real estate taxes	Area occupied
6. Taxes on machinery and equipment	Valuation
7. Personal property and other taxes	Gross profits
8. Depreciation of buildings	Area occupied
9. Depreciation of machinery and equipment	Valuation
10. Depreciation of furniture and fixtures	In proportion to commercial burden
11. Repairs to building	Area occupied
12. Power and light	Annual kilowatt hours
13. Heat	Area occupied

The budgeted estimate for each class of cost or expense was distributed on the base indicated. Then all costs for each department were cross-added and reduced to a percentage of the grand total expense. Whatever expenditures are made each month are charged as paid to a clearing group of fixed expense accounts. At the end of each month, whatever is spent is spread to the departments and cost centers on the basis of the budget percentages established. Each month the same percentages are used. If the budgeting is done properly, with due consideration of all the factors involved, at the end

of the year the total of the monthly charges to the departments and cost centers will be as computed on the original distribution statement. If adjustments are necessary, they should be prorated on the same percentages and each department and cost center adjusted in ratio with the original budget.

Distribution of Burden: (1) Up to Factory Costs and (2) Up to Full Cost

The distribution principle followed for fixed expenses is next applied to all overhead and burden department costs. The process is divided into two operations, the first to obtain a net distribution percentage for all costs which have to be added to the direct costs to get the total factory cost, the second to obtain a net distribution percentage for all costs which have to be added to the total factory cost to get the all-inclusive costs. The costs included in these two groups are budgeted for the year and a cost center allocation made on the bases indicated in the remainder of this paragraph. In the first group are again included fixed expenses, based on the budgeted distribution already outlined; stock storage and handling expense, distributed on the basis of the weight of materials handled for each department and cost center; and factory administration expense, distributed on the labor and material ingredients of the production of each department and cost center. In the second group are packing, shipping and delivery expense, with distribution on a combination of time study and the labor and material ingredients; marketing administration and general commercial expenses, allocated on the labor and material ingredients; and selling expenses spread on an analysis of the previous year's costs by territories and products. In each group, the several items are totalled and reduced to a single percentage for each department and cost center.

A Clearer Picture of Make-Up of Costs

From an accounting point of view, the net result, with an interlocking cost system, is that, instead of 200 prorations and 400 postings each month, there are only 80 calculations and 86 postings. From an analysis point of view, it means that all guess-work and analysis is eliminated and it is definitely known just how much of the departmental and cost center costs are fixed expenses and overhead. Burden just does not "snowball" in the cost figures. The use of the percentage formulae developed has permitted a still further simplification in carrying departmental and cost center costs to products on the operating report. It has been determined to what extent each department contributes to each product both in standard costs and variances. Therefore, it is possible, by use of the percentage formulae, to indicate just what part of each product cost is materials, standard labor and overhead, variance, and general, administrative and selling expense.

The Costing of Unfinished Joint Products

by

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The relative-sales-value method of costing by-products is, in this article, applied specifically to unfinished products, for which a sales value must be derived from sales value of a related product before the costing can be performed. A means of doing this and then of working and applying the cost to sales value ratio, is illustrated in a step-by-step manner.

COMPANIES WHICH PRODUCE joint or co-products find their cost accounting to be far more complex than that of other companies, because of the difficulties involved in allocating or pro-rating their raw material and manufacturing costs between the several salable products which result. The major problem involved lies in reaching an equitable and realistic basis for allocating such costs.

Why "Relative Sales Value" Or Other Arbitrary Method?

Although it is possible, in certain segments or certain stages of the manufacture of joint products, to obtain some definite material, labor, and overhead allocation to specific products, the manufacturing process, viewed as a whole, requires the use of at least some arbitrary bases for the necessary allocations and prorations. In certain industries, in which the joint products all stem from an initial input of one or more raw materials, an arbitrary basis must be used at the initial split-up point, thereby diminishing the value of any attempt at accurate allocation in subsequent stages of production. At all events, any attempt at accurate allocation of manufacturing costs must necessarily involve a thorough knowledge of each step in the several manufacturing processes involved, as well as a laborious tracing of the flow of costs through each process.

The degree of accuracy possible under this laborious method of costing is generally not commensurate with the necessary effort and cost. As a direct result of the recognition of the futility and high cost of attempting accurate direct costing of joint products, simplified and practical methods of arbitrary cost allocations have evolved in many industries. One such method of allocation, known as the "relative sales value method" is widely used and offers a satisfactory means of valuing finished goods, and unfinished goods, too, as this paper will attempt to show.

No doubt there are many variations of this method in use today. In general, it involves relating the total cost — material, labor, and overhead — to the total sales value of the finished and unfinished products manufactured during the period, to produce a "cost factor" for use in effecting allocations. If the products have been produced at a profit, this cost factor is necessarily less than 100 per cent. If the cost factor is, say 90 per cent, the arbitrary assumption is then made that the sales value of each of the products involved may be multiplied by this rate to arrive at its cost value. In this way, each of the products comprising the entire group produced during the period is assumed to have a cost relationship of 90 per cent of its sales value. Arbitrary? Of course! But the widespread use of the method plus its acceptance by the Treasury Department for inventory valuation purposes suggests that other methods, presumably more exact and less arbitrary, have not produced results worth the additional time and cost.

In short, it must be recognized that accountants so far have failed in their efforts to determine with accuracy the cost value of the raw material component of a joint product produced from one mother liquor, such as the gasoline produced from crude oil. Even the manufacturing expense associated with this product involves arbitrary prorations. Hence, it is significant and helpful that, by the use of a cost factor, calculated as outlined above, it is a simple matter to establish the "cost" of the finished goods inventories.

The Problem Posed by Unfinished Products

It is simple for the finished products because they have a known market price. However, the costing of unfinished goods—which are not in salable condition and for which no known market price exists—presents a further problem and a very real one. The solution to this problem is found through the use of what may be referred to as "unfinished products cost differentials." These differentials represent a calculated amount which is estimated will have to be spent before the product may be considered in salable condition. In other words, the selling price of the finished product, less manufacturing costs to finish and less profit, equals the "cost" to be used for inventory purposes.

Before continuing further, it may be well to point out that the detailed description of procedure which follows is not necessarily an accounting innovation. Indeed, many companies may have developed similar procedures in their search for a common-sense solution to what has always been a very knotty problem. Nor is it suggested that this method is the best of all developed. We do suggest that it is at least one solution. It may be found readily adaptable to a company's own situation or it may provide the neces-

RAW MATERIAL INPUT SCHEDULE

Raw material input	Inventory Feb. 28, 1953	12-month purchases	Inventory Feb. 28, 1954	Consumed gallons	Moving Avg. 12-mo. cost per gall.	Consumption cost
Raw material A	600,000	7,200,200	800,000	7,000,000	.0980	$ 686,000
Raw material B	300,000	3,600,000	280,000	3,620,000	.1000	362,000
Raw material C	100,000	1,200,000	100,000	1,200,000	.1010	121,200
Total raw material input	1,000,000	12,000,000	1,180,000	11,820,000		$ 1,169,200
Additional costs						
Additive A	500#	6,000#	500#	6,000#	.3010	$ 1,800
Additive B	200#	2,400#	600#	2,000#	.1000	820
						$ 2,688

EXHIBIT 1

sary spark to thinking to create a solution more adapted to its needs. In any event, from here on, this article will seek to present all information needed for use of the method and to supply examples, necessary work sheets, and exhibits.

The Frame-Work of the Procedure

In order that the solution to the problem of valuing unfinished products may be placed in its proper perspective, it is necessary to fit it into the relative sales value method, of which it is only a small but very necessary part. Therefore, in what follows, emphasis is placed on the aspect of the method which involves a procedure for valuing unfinished products. Exhibit 1 is a Raw Material Input Schedule, from which were produced the finished and unfinished joint products listed in the Costing Schedule, Exhibit 2. It should be noted that this schedule also shows a class of input captioned, "additives." These additives consist of materials which are added to specific products both during and after manufacture so that, insofar as these items are concerned, they must be considered as costs specifically allocable to certain of the finished products. Therefore, if the additives, unlike the raw materials, are applied directly to certain products, the cost of these products must be determined first before these costs are taken in.

As Exhibit 1 indicates, the total quantity of raw materials consumed in manufacture for the period is calculated through the well-known method of opening inventory plus purchases minus closing inventory. The quantities thus calculated are extended to reach the dollar value of materials consumed. An important feature of Exhibit 1 is the use of a 12-month moving average to determine the purchases shown and also to determine the unit costs of the various raw materials. This averaging serves the purpose of minimizing the effects of seasonal and other fluctuations as a look at the lower half of Exhibit 1 will show. The value of the additives used during the period is calculated in the same manner as for the raw materials. For the sake of

simplicity, the assumption is made that the cost of these particular additives pertains solely to Finished Product C dealt with in Exhibit 2.

For Exhibit 2, to begin with, only figures related to finished product sales, to opening inventories and production quantities can be supplied directly for individual products. However, at the bottom of Exhibit 2, the raw material input cost and additive cost from Exhibit 1 are combined with manufacturing costs (labor and overhead) to give the total production costs for the period. The dollar total is shown on Line 17, Column 7, in line with total quantities in Column 4. These totals are then transferred up to Line 13 and additives cost, and manufacturing losses are subtracted to arrive at the totals shown under columns 4 and 7 on Line 10. At this stage, we are working towards a figure for Line 10, column 6, which represents the total sales value of production for the 12-month period. This figure is needed in calculating the cost factor previously mentioned, which is the relationship of total cost of production to its total sales value, so that the other missing figures—production cost and closing inventory—may be supplied for each line.

Obtaining Cost Differentials for Uncompleted Products

From an inspection of Exhibit 2, it is obvious that, in order to arrive at the total sales value of production, it is necessary first to assign a sales value of production to each of the products listed, both finished and unfinished. For finished products no special problem is involved, since the 12-month average price is readily determined from sales statistics. The matter of determining the sales value assignable to the unfinished products, however, requires special treatment. This problem is solved through the use of process cost differentials. The use of these is illustrated in a very simple way in Exhibit 3.

In this Exhibit it is assumed that an adequate system of yield accounting is maintained so that it is possible to determine at any stage of completion what percentages of finished and/or unfinished products will be produced through each of the subsequent stages of manufacture. For example, in Exhibit 3 are shown Unfinished Product A and Unfinished Product B. The first of these, unfinished Product A, must go through one more manufacturing process before it is transformed into 94.8 per cent of Finished Product B. Experience has shown, it is assumed, that 5.2 per cent of Unfinished Product A will be lost in this last stage of manufacture. Based on historical data over a representative period of time, assuming normal manufacturing costs and average throughput quantities of product, the processing cost per unit of throughput may be determined to be, say, .0193 cents, as given in the example.

Now, all the facts are known. The

COSTING SCHEDULE

Finished and Unfinished products produced 12-mos. ended 11/30/53	Inventory 11/30/53	Sales 12 months 11/30/53	Inventory 11/30/52	12-months production (quantity)	12-months average sales price	Sales value of production	Cost value of production	Unit cost
1. Finished product A	3,000	51,000	4,000	50,000	1280	6,080	5,400	.1080
2. Finished product B	5,500	85,500	1,000	90,000	.1000	9,000	9,100	.0900
3. Finished product C	10,500	140,000	8,560	144,000	See Ex. 4	40,880	36,792	
4. Additives				1,000			2,620	
				145,000			39,412	.2718
6. All other finished products	900,000	8,200,000	800,000	8,300,000	.1700	1,411,000	1,269,900	.1530
7. Unfinished product A	20,000		12,005	8,000	.0755	604	544	.0680
8. Unfinished product B	25,000		50,000	(25,000)	.0901	(2,253)	(2,028)	.0811
9. All other unfinished products	4,133,000		1,000,000	3,133,000	.0494	154,650	139,185	.0445
10. Totals	5,097,000	8,476,500	1,872,500	11,700,000		1,619,881	$1,457,893	
11. Loss in manufacture				120,000				
12. Additives cost				1,000			2,620	
13.				11,821,000			$1,460,513	
14. Raw material input				11,820,000			1,169,200	
15. Additives cost				1,000			2,620	
16. Manufacturing cost				-			288,693	
17. Total				11,821,000			$1,460,513	

EXHIBIT 2

problem is to arrive at a value for which Unfinished Product A might be sold if a market existed for it in its unfinished state. When completed into Finished Product B, it will be worth $.1000 cents per unit. To process it to completion will cost $.0193 cents per unit in manufacturing or processing costs. The 5.2 per cent of the unfinished product lost in the process represents a loss of 5.2 per cent of the .1000 Finished Product B price or $.0052 cents. The manufacturing costs plus the manufacturing loss subtracted from Finished Product B price equals the assumed sales price of Unfinished Product A, or $.0755 cents. This is the price used in Exhibit 2 to arrive at the sales value of Unfinished Product A shown in Column 6 as $604. The cost differential in Exhibit 3 has been developed to be $–.045 cents and represents the expenditure necessary to process Unfinished Product A to completion.

As to Unfinished Product B shown in Exhibit 2, it is two stages removed from completion. Perhaps it is more correct to say that, in the next manufacturing stage, 88 per cent will be completed into Finished Product A and into Finished Product B, while 10 per cent will become Unfinished Product A and 2 per cent will be lost. With these assumed facts known and with sales prices available, the sales price of Unfinished Product B in Exhibit 2 is shown to be $.1112 cents. However, to process it, costs $.0211. After deducting this cost, the sales price is finally determined to be the $.0901 cents shown in the example. The differential of $–.0299 cents has been arrived at by subtracting the sales price of Unfinished Product B from the sales price of the maximum volume product which, in this case, is Finished Product A.

Now, a word about these differentials. It has probably been noticed

UNFINISHED PRODUCTS VALUATION AND COST DIFFERENTIAL

Unfinished Product A				
12 months average sales price of Finished Product B			.1000	
Less: Processing cost per gallon		.0193		
Manufacturing loss: 5.2% x .1000		.0052	.0245	
Sales price of Unfinished Product A			.0755	-.0245
Product reference: Finished Product B				
Unfinished Product B				
Ultimate Yield	%	Sales price	Proportionate value	
Finished Product A	78.00	.1200	.0936	
Finished Product B	10.00	.1000	.0100	
Unfinished Product A	10.00	.0755	.0076	
Loss in processing	2.00	-	-	
	100.00		.1112	
Less: Processing cost per gallon			.0211	
Sales price of Unfinished Product A			.0901	-.0299
Product reference: Finished Product A				

EXHIBIT 3

that to obtain these differentials, each of the unfinished products has been related to some finished product. In each case, the finished product reference is the one into which all, or mostly all, of the unfinished product will be subsequently transformed. But why compute these differentials when the sales price has already been determined as shown in Exhibit 3? There is a very good reason. It is necessary to go through with the valuation method exemplified by Exhibit 3 only if one or both of two things occur: if the product yield pattern changes or if manufacturing or processing costs change. If neither of these factors change, then the differentials will not have to be changed, regardless of the variations in sales prices to which they are related. If the reference product sales price subsequently goes up $.01 cent, the sales value of the unfinished product goes up a like amount, since the differential is fixed.

Therefore, the sales prices of the unfinished products shown in Exhibit 3 have no lasting significance, but the differentials do. Once computed, they may be used month after month until changing manufacturing costs or yield changes finally make it necessary to recompute them. It is fortunate that this is so, as it may readily be apparent by now that calculation of differentials could be a fairly laborious task, particularly if many unfinished products are involved and if the manufacturing stages are numerous and complex.

Applying the Cost Factor

To go back again, to Exhibit 2, with average sales prices available for Column 5 by the means just described and commented upon, it is now possible to compute Column 6, Sales

PRODUCTION VALUE OF FINISHED PRODUCT C			
Sold 12-months ended February 28, 1953	140,000	$ .3000	$42,000
Produced 12-months ended February 28, 1953	145,000	.3000	$43,500
Less Additives Used			
Additive A (6000#)	750		1,800
Additive B (2000#)	250		820
Additive Blending Cost	-		-
Sales value of production less additives	144,000	(See Ex. 1)	$40,880

EXHIBIT 4

Value of Production, the total of which is shown, on Line 10, to be $1,619,881. How Column 7 total on the same line was arrived at has already been covered. The total of Column 7 is divided by the total of Column 6. It results in a cost to sales ratio of 90 per cent, the cost factor we have been trying to determine.

At this point, it is possible to compute the cost value of production of each of the products listed in the costing schedule, thus supplying the detail of Column 7, by multiplying each sales value of production by the 90 per cent cost factor. The inventory unit cost price of each of the products involved may be obtained by dividing the cost value of production, Column 6, by the production quantity, Column 4. It is not entirely necessary to compute these values for Column 7, however, since the unit costs may be obtained directly by multiplying each of the sales prices shown in Column 5 by the 90 per cent cost factor.

The cost factor has been said to be 90 per cent. Following the rule of significant digits, it is desirable from the standpoint of accuracy, to carry out the answer to one more decimal place than there are digits in the largest number by which it is to be multiplied. In the example, the cost factor should be extended to five decimal places, since four digits are used in each of the sales prices involved.

One problem which has been mentioned only briefly concerns the handling of the additives cost, which has been assumed to apply only to Finished Product C. Exhibit 4 shows that 140,000 units of this product sold for the 12-month period ended February 28, 1953, at an average selling price of $.30 unit. That the sales value was $42,000 is of no significance. All that is needed is the $.30 cents selling price to determine the $43,500 sales value of the 145,000 units produced during the period. But this $43,500 sales value includes the full cost value of the additives, yet only 90 per cent of the remaining sales value represents the cost to produce that portion of Product C which had its origin in the basic raw material input. This accounts for the special cost treatment

for Finished Product C as shown in Exhibits 2 and 4.

Should a company decide to use the unfinished by-product costing method set forth in this article, it may find that the advantage of added accuracy to be gained from a monthly re-costing of inventories is not worth the time spent, because the appreciation or depreciation in inventories occasioned by monthly re-costing affects total profit only slightly. In this case, it may be well to consider re-costing on a quarterly basis, so spaced throughout the year that the inventories are currently re-costed for the month-end which coincides with the fiscal or calendar year closing.

The Key: A "Sales Value" for Unfinished Products

To summarize, the problem of determining a cost value for the unfinished portions of the joint or co-product inventory arises because it is an essential step in the relative sales value method of inventory valuation. This problem is solved by determining a sales value of each of the unfinished goods at each of their several steps of manufacture, through subtracting differentials from the sales value of the major finished product to which it is related. Once the sales value of the unfinished product is determined, it takes its place in the calculation of the cost factor, which is applied to all the individual sales values to reduce them to the cost basis.

The illustrations used in this paper were intentionally simplified in order to make possible an unobstructed run of the basic procedures used in this inventory costing method. It is important to note, too, that a discussion of manufacturing costs, though important, was deliberately excluded in view of the dangers involved in making generalizations. It is obvious that certain costs should be excluded from the manufacturing cost calculation, but each such calculation must be tailored to meet the specific needs of the individual company.

Control Numbers for Engineering Department Costs

by D. S. MITCHELL

Assistant to the Treasurer, Sangamo Electric Company, Springfield, Ill.

The units of a company organization, the work of which is largely made up of the initial stages of capitalizable projects but includes much other work also, and the operations of which are predominantly labor but include appreciable material consumption, have always been difficult to account for, whether for general accounting or for reporting purposes. This article outlines a system overcoming some of the obstacles.

THE PROBLEM OF ACCOUNTING for and properly distributing indirect labor costs in a manufacturing plant presents a complex and interesting task. The activities of such labor represent purely departmental functions or they may involve the production of both tangible and intangible capital assets. In order to facilitate the accumulation and recording of costs against the proper function, a system of control numbers may be used to serve as a means of identifying the various types of work to be undertaken. This is the more practicable because some departments are particularly amenable to definite identification of costs with the various tasks performed. After a careful analysis is made of the types of work being done in the departments it is possible to set up a system of control numbers which, by their construction, will identify the tasks to be performed and will greatly facilitate both control and accounting. Specifically these departments are:

1. Engineering.
2. Tool design.
3. Drafting.
4. Model room.
5. Machine shop.
6. Maintenance.

The Activities and the Number Scheme

There are several possible fields of activity which cover the normal functions of the departments listed above. First, there is development and experimental work carried on by the engineering, drafting, and model room departments. There is also construction or purchase of new capital assets, which may be a common function of all the departments or may only involve one of them on any one project. In addition, the departments incur labor costs on functions which pertain only to the internal operation of the department. Finally, although it is strictly an engineering department task, investigation of changes suggested by users of the company's product, which may offer new uses on the market, may be mentioned.

To provide the framework for setting up a system, certain groups of

numbers must be reserved for the identification of the various fields of activity. This can be accomplished in the following manner:

100 thru 2999	Control orders for product lines.
3000 thru 4999	Initial development orders.
5000 thru 6999	Sales proposals.
6000 thru 7999	Standing orders.

The type of work being performed is also coded to the capital asset accounts as maintained in the general ledger:

1. Machinery.
2. Tools and dies.
3. Equipment.
4. Furniture and fixtures.
5. Short-life equipment.
6. Buildings.
7. Welfare equipment.

An initial example of how a control order number is established from the information given above may be helpful here. In the series of control order numbers reserved for product lines, assume that 110 has been set aside for single-phase meters. An appropriation has been approved for the sixteenth project for this line and it will be concerned with the manufacture of the tools and dies, and will also call for the purchase of some equipment. Since there are two distinct phases to the project, it will be necessary to assign two control order numbers: 110-16-2 and 110-16-3. All labor cards, supply and material requisitions and purchase orders pertaining to the manufacture of the tools and dies for the project will be identified by the number 110-16-2. The purchase orders for the equipment will be identified by 110-16-3. If there is any installation cost in connection with the purchase of the equipment, the labor cards for this work will also be identified by 110-16-3.

In order for the control number system to work effectively, a full explanation of the meaning of the numbering system and a clear description of the purpose and use of the various types of orders must be prepared and distributed to all personnel. An understanding and appreciation of the system by the people who are to report costs will insure a more accurate distribution of the expenditures incurred.

Orders Which Represent Initial Development

In line with the numbering scheme, work performed in the engineering department which involves the improvement or change of existing products or is original experimental work, is to be reported under a number assigned to the project in the 5000 series. When a decision is made to start a project, a request for an appropriation is submitted by the engineering department for approval. This request states in detail the type of work to be performed, the expected results and the estimated cost to be incurred. The number of the request for an appropriation is the same as the initial development order assigned. After the appropriation has been approved and

the information concerning the project (including the number) has been distributed to the personnel in charge of the work, any cost of labor and material used on the task is to be reported against that number. In case purchases are made from outside vendors, the initial development number must be shown on the purchase orders. When work is required on the project in other departments, it is the responsibility of the engineering department to provide the order number to be used for the accumulation of costs.

At some point in the program, a decision must be made regarding the costs which have been incurred. If it is determined that the project will not develop in the manner outlined in the appropriation request and, therefore, no material benefit will be realized by the company, the order number is closed out and all work stops. The act of closing out a control number consists of a written notice being sent to the personnel in charge of or interested in the job, stating that all work will cease on the program and that the number can no longer be used for recording and reporting charges. A copy of this notice is also sent to the appropriation section for its records. If, on the other hand, it is decided that the work has developed the desired results, and that the information gained should be incorporated into some phase of the regular product lines, the initial development order is closed out in this instance, too, and the engineering department submits a new request for an appropriation for tooling and engineering costs, for which an appropriate product control order number is now in order. After the appropriation has been approved, all future costs are charged against the new number.

Work and Procedure Under Control Orders

Two types of activity have already been indicated as subject to the issuance of a control order number:

1. The purchase and/or construction of new capital assets, both tangible and intangible, which are to be required in conjunction with a product line. (100-2999 series).
2. The purchase and/or construction of new capital assets which are for general use and cannot be identified with a product line, e.g., office furniture and fixtures, automobiles, drill presses, lathes, etc. (3000-4999 series).

When a request for an appropriation is submitted and there are several definite aspects to the program, the cost for each phase must be set forth in detail so that separate numbers can be assigned. This makes it easier to report costs against a definite part of the program and reduces the confusion as to the proper number to be charged. If a multiplicity of tasks are combined under one order number, the difficulties presented in reporting and recording costs reduce it to a meaningless task. This is particularly true when the time comes to transfer the charges to capital asset accounts. All labor costs, requisitions for materials from stores, and purchase orders for items bought out-

side must be identified by the proper order number.

The control order is a multi-purpose tool to be used for reporting costs on many types of work. The charges to be reported against a job and the disposition of those costs, to be made by the appropriation section, are shown in the body of the approved appropriation. Copies of the appropriation are distributed to all departments which are concerned with the proposed work. In case there is any doubt regarding the use of a number for recording any charge, the appropriation is referred to for verification. So that the personnel of the departments, who perform work on projects covered by a control order number, will know the open numbers against which charges can be made, index sheets are sent out each week by the appropriation section. These sheets show the order number, a brief description of the project and the date the work was authorized.

How the Standing Orders Help Effect Departmental Control

The standing orders represent each department's "domestic" activities. A detailed analysis of labor costs incurred in a department for routine functions can be obtained through the use of a standing order control number for applicable work. This class of number is used only for the reporting of labor costs and is not used to report supply usage, even though the supplies are consumed in the function performed. The standing order number series has already been noted as 7000-7944. For purposes of identification, the first two digits of the number represent the department and the last two the function being performed. To illustrate, suppose that the maintenance department has been given the identifying number of 75. The following is a listing of standing order numbers which might be appropriate:

7501 Supervision.
7502 Clerical work.
7503 Attending supervisors' meeting.
7505 Maintenance of general equipment.
7506 Maintenance of grounds and parking lots.
7507 Maintenance of buildings, excluding painting.
7508 Maintenance of machines and tools.
7509 Maintenance of electric motors.
7510 Maintenance of buildings—painting.
7511 Maintenance of departmental plant systems (exhaust, sinks, sewers, sprinklers, etc.)
7512 Maintenance of general plant systems (compressors, gas heating, water, auto-calls, power, steam traps, etc.)
7513 Maintenance of boiler room equipment.
7514 Boiler room operating labor.
7515 Welfare work for the personnel department.
7516 Construction of new safety guards, rails, etc.
7517 Clean up work in the maintenance department.
7518 Minor re-arrangement of departments or offices.
7519 Salvaging of old supplies and material.
7520 Installing temporary equipment.
7521 Taking inventory.
7522 Union work.
7523 Plant inspection.
7524 Fires in plant.
7525 Safety committee.
7526 General welding.
7527 Stock clerk.
7528 Work in connection with cafeterias.

At the end of each month, a tabulated listing of labor costs, as reported under the standing order numbers, is prepared for each department head. This type of analysis gives a clear picture of the time spent on the various departmental functions and can be used effectively for cost control purposes.

Function and Use of Sales Proposals Numbers

When a request is made by a customer for investigation into the possibilities of changes or adaptations of existing products, a sales proposal number is assigned by the engineering department to the project. This type of number is used only for tasks which are small in scope, the cost not to exceed $200, and is used to accumulate both labor and material costs incurred in the investigation. All labor tickets, material requisitions and purchase orders for supplies are identified by the sales proposal number.

An index of proposal numbers, the 6000-6999 series, is set up in the engineering department by major product classification. As requests are received from customers, project numbers are assigned within the major groups. At the end of each year, all the open proposal numbers are examined to ascertain the disposition to be made of the accumulated charges. In the majority of cases, the proposal will be closed out at the end of the investigation and any charges made will be shown as product engineering. One other possibility is that a decision may be made to continue the work under an initial development order for purposes of further investigation or a product number may be assigned for tooling costs, so that the results obtained may be incorporated in the regular lines. The continuation of the work under either of the two types of orders mentioned requires the submission of a request for an appropriation.

Bookkeeping Basis of the Control Number System

If the proper investigation is made of the types of work performed in the departments to which the assigning of control numbers is applicable, a complete accounting can be obtained of all the labor costs incurred. The total labor reported under the four classes of numbers—initial development, control, standing, and sales proposal—should account for all the costs of the department. By assigning control numbers so that they identify the functions being performed and acquainting the personnel with the meaning of the numbers and how they are to be used, more accurate information is obtained.

Information for the accounting and reporting processes of the control number system is obtained from the following sources:

1. The purchase journal, in which are recorded all asset, material and supply items bought from vendors.
2. A tabulated report of material requi-

sitions drawn on raw stores, for projects to which a number has been assigned.
3. A tabulated report of all labor costs reported on control order labor cards pertaining to any of the classes of control numbers.
4. A tabulated report of general factory labor performed on projects identified by a control number.

So far as transactions pertain to the acquisition of capital assets, they are charged to one of two "interim" accounts, construction in progress—material and construction in progress—labor and burden. These accounts are maintained in the general ledger and the balances as reflected there are supported by subsidiary records maintained in the appropriation section which maintains its own control in the form of an appropriation ledger. As information is received for the various sources, the data is recorded on tabulating cards. These cards are filed by control number and, by adding cards for the charges and transferring them for items capitalized, the amounts showing on the remaining cards at the end of the accounting period constitute the detail to the general ledger balances.

Charges Which Come from the Purchase Journal

A column is set aside in the purchase journal to handle all charges to the construction-in-progress materials account. These are classified on the face of the vendors' invoices by personnel of the appropriation section. As charges are received from the purchase journal which affect the construction in progress-materials account, the following information is transferred from the invoice to a tabulating card, which is used as the subsidiary record:

1. Description of the asset or component part and quantity.
2. Control order number.
3. Department in which the asset is located.
4. The year of the purchase.
5. The vendor's name.
6. Purchase order number.
7. Cost.

When a control order number has been used, against which charges are to be accumulated, a posting is made in the appropriation ledger to record the cost. Each appropriation is shown on a separate sheet in this ledger and columns are set up so that an analysis of different types of charges against a control order number can be automatically made. By comparing the information shown in this record with the amount of the appropriation, the relationship between the amount allowed for the work and the actual costs incurred can be readily seen. All material account cards prepared during an accounting period are checked out in detail with the purchase journal posting before they are filed in the subsidiary record.

In addition to charges concerning capital assets, entries are also made for materials and supplies purchased for sales proposals and initial development orders. Any material costs incurred for a sales proposal are classified as a supply item, and the cost remains on the books as a charge against the depart-

ment in which the work is being performed. In case a decision is made to capitalize any of the charges by the engineering department, entries are prepared to transfer the costs from the department to which they were originally charged to the experimental and development intangible asset account. Since the total accumulated against a sales proposal is usually small (not in excess of $200), the amounts transferred from departmental expense do not cause much distortion in the expense accounts.

Charges against an initial development order are handled in much the same manner. The expense remains on the records as a charge to the department in which the work is being performed until a decision is made to transfer the charges to the experimental and development account. In both instances, the amounts to be transferred from departmental expense to the capital asset account are based upon the postings which have been made in the appropriation ledger. As is also the case with the construction of fixed assets, the charges to be transferred are reviewed with the person in charge of the project to see that the costs picked up refer to the work performed.

The total of the material account column in the purchase journal is posted in total to the general ledger account at the end of the accounting period by the accounting department.

Charges from Raw Material Requisitions

Materials drawn from raw stores to be used in the construction of a capital asset or other project are identified by the use of a control number. These requisitions, which are made out on tabulating cards, are processed by the appropriation section and turned over to the tabulating section for use in preparing the raw material requisition report. A direct transfer is made by the accounting department from the inventory account to the construction materials account. Requisitions which are identified with a sales proposal or an initial development order are transferred to the appropriate departmental supply usage account. The information which appears on the cards is:

1. Department drawing the material.
2. Code number of the material.
3. Quantity requisitioned.
4. Description of the material.
5. Control number.

The requisitions are priced at standard cost by the tabulating section and the report is run, showing by departments the total amount of material cost charged. The appropriation section uses the individual cards as a part of the subsidiary record for the construction-in-progress materials account.

Progress Reporting

The appropriation section is interested in accumulating all costs charged against control and initial development orders, both of which are issued only after a request for an appropriation

has been submitted and approved. As the information from the various sources flows through the section, entries are made in the appropriation ledger against the number affected. At the close of each month, the tabulating section, which has been given a listing of all open numbers, prepares summary cards from all the tabulating cards handled bearing any of the numbers. By using the summary cards for the current month and adding the amounts so determined to the balances from the preceding month, a tabulated report is prepared showing:

1. The control or initial development order number.
2. A description of the project.
3. The date the project was approved.
4. The amount of funds appropriated.
5. Expenditures for the current month by department and type.
6. Total of expenditures to date by department and type.

This tabulation is sent to the personnel who have charge of the various projects, after the results of the tabulation have been checked back to the appropriation ledger detail. By taking into consideration the stage of the project and the amount charged against the appropriation, it is possible to determine if the balance of funds allowed will be sufficient to complete the work. If there are any questions regarding the charges made, the detail from the subsidiary record is used to supply the answers.

Another important function served by the appropriation report is the information which can be determined regarding the cash requirements to complete the work in process. By consulting with the people in charge of the work, the approximate date of the requirements can also be learned. This function becomes increasingly important as the cash position of the business takes on more importance than it has for the past few years.

What is Accomplished

By using a control number system for the identification of engineering-type jobs being performed in the plant and by relating such a system to an appropriation procedure, the problem of reporting and recording such costs is simplified and more accurate results can be obtained. If the system is installed with the idea that a description of the work being performed can be incorporated in the number identifying the project, a real and useful tool is presented for cost collecting. It can be extended even beyond engineering and engineering-related departments. Once a system of this nature has been adopted and the personnel working on jobs subject to the assignment of control numbers have been educated as to the meaning and purpose of the numbers, a greater degree of consistency in reporting can be attained, which will result in more accurate costs being capitalized and more effective control of other departmental costs.

Letters to the Editor

OUR BUSINESS IS WITH PEOPLE

Editor, *N.A.C.A. Bulletin:*

FOR YEARS, accountants have been faced with many problems of a technical nature. Sometimes they have lost sight of other factors which are probably more important than technical knowledge. Technical know-how can be acquired, often by mere exposure in frequent doses. (To a certain extent, reasoning can now be accomplished even by electronic machines.)

However, there is one attribute, for which there is no substitute and without which there can be no success. The secret of this one all-important factor can be stated in one word "tact." In our business relations we may arrive at amazingly accurate and enlightening conclusions. If they are presented in such a manner as to cause offense or displeasure to someone, they will undoubtedly end up as material for the storage file.

Whatever we may know, we have not yet even scratched the surface of what there is yet to learn. We shall make many mistakes and must remember that the other fellow's opinion is as important to him as ours is to us. To tell him bluntly he is wrong is unpardonable. To concede the logic which exists in his reasoning and examine the facts further is intelligent. It will gain both his respect and his friendship. The most we can lose is an argument and we may gain a friend.

One thing which can well be avoided is talking too much, particularly in the first person pronoun. We must learn to listen. Many a man would rather you heard his story than granted his request. Many a sick person has called in a doctor so that he may tell his troubles to a good listener. The good works of years can be obliterated with a single unkind word. It has been well said, "Talking should be an exercise of the brain rather than the tongue."

Business today is made up of more than machines. It is made up primarily of people. Each one is different and may react differently to the same situation. All will usually soften under the effects of courtesy and tact. Each has his own likes and dislikes and is to himself the most important person living. It is not necessary that we understand everyone completely but we must be able to get along with all, and they have to get along with us.

There is nothing new or startling in these comments. They reveal nothing that we do not already know. But they are extremely important and bear repetition and re-emphasis.

CHARLES G. WILEY, *Jamestown Chapter.*

CHANGED TREATMENT OF FEES IN CONTRACT ACCOUNTING

Editor, *N.A.C.A. Bulletin:*

Within the past year there have been strong indications that the Government plans to relax the stringent regulations in the area of allowable costs. Fees and commissions paid to individuals and agencies employed to represent a contractor are costs now allowed to a limited extent. The author, who recently had occasion to work in this field while serving with the Air Force, believes that these signs indicate a new trend in the Government's position on initial contract pricing and redetermination.

The most important single issue is whether the fee is reasonable. In making such determination, the contracting officer will be guided by certain principles contained in

ASPR Section 1, Part 5, as briefly indicated below:

In regard to a selling agency—

1. Is fee exorbitant in relation to services actually rendered? (Regard may be given to fees customarily paid in the trade or business for nongovernment work.)

2. Are services rendered (other than actual solicitation) such as technical and managerial services and assistance in procurement of essential personnel, facilities, equipment, materials, subcontracts, etc.

Other important factors to be considered are:

1. Continuity of relationship between the contractor and the agency charging the fee. (This guide does not disqualify newly-established relationships but representation over a long period of time is a factor in a contractor's favor.)

2. If the selling agency confines its work to government contracts only, it is not disqualified but representation in government and nongovernment work is a factor favorable to allowance of agency expense.

3. If it appears that the agency was organized immediately prior to or during periods of expanded government procurement, it will be liable to closer scrutiny.

In regard to a bona fide employee—

A bona fide employee means an individual employed by a concern in good faith to devote his full time to such concern and no other concern and over whom the concern has the right to exercise supervision and control as to time, place, and manner of performance of work. It is recognized that a concern, especially a small-business concern, may employ an individual who represents other concerns:

1. A person may be a bona fide employee whether his compensation is on a fixed-salary basis, or when customary in the trade, on a percentage, commission or other contingent basis.

2. The hiring must contemplate some continuity and it may not be related only to the obtaining of one or more specific Government contracts.

3. An employee is not bona fide who seeks to obtain any Government contract through the use of improper influence or who holds himself out as being able to obtain any Government contract through improper influence.

There is no standard test which every employee or agency must meet but the remuneration for services rendered must be reasonable and the association with the contractor must generally conform to the above requirements. The adoption of these requirements by the Government appears to be a sound, commonsense approach to a once troublesome problem. Previously, contingent fees were given no consideration as an allowable cost and the very mention of a contingent fee arrangement caused negotiators to view the setup with strong suspicion. This line of thinking hurt the small contractor who derived a substantial portion of his business from the Government, yet could not afford to retain a full-time employee on government projects. The economic usefulness of a selling organization was wholly ignored because fear of possible abuses which could (and sometimes did) arise, pervaded the thinking in this area.

The foregoing reference to economic usefulness of a selling agency representing a number of contractors or subcontractors, may be illustrated by simple example. A company acts as a selling agency for a group of small manufacturers who make aircraft parts or standard Army-Navy parts. The total volume of business from eight or ten of these operators would merit the support of an agency, but none of them could individually afford the expense. There is a need for these parts just as there is a need for larger, more costly items. Without the selling agency to make the contact, both the contractor and the Government would be the loser.

Today, instead of taking the narrow traditional approach which regarded such an agency as a parasite, which of itself offered nothing as it had no productive facilities, the Government has adopted the realistic approach which recognizes the useful and necessary service it performs. This broad approach will aid in the placing of contracts with more small businesses, an object which is itself a collateral policy of the Government.

WILLIAM L. GLADSTONE

HANDLING OF LEARNING CURVES

Editor, *N.A.C.A. Bulletin:*

MY ATTENTION WAS ONLY very recently directed to Rolfe Wyer's excellent article on learning curves in the December, 1953 issue of the *N.A.C.A. Bulletin*. This letter is written because the author did not point out the one very dangerous pitfall which can trap the unwary user of learning curves. I feel that comment on this point is necessary. Learning curves are one of my own most useful tools and I would dislike to see the erroneous results of a misapplication destroy anyone's confidence in what should be a very valuable technique. In essence, the danger lies in combining data from two separate operations on which the learning rate differs.

For example, Employee A is performing one of the operations on a new item. He has performed other similar (though not identical) operations before, and, because of his experience, starts out at a fairly high rate of production. Naturally, as more experience is gained, time (and cost) is reduced but, because of the familiarity with the processes, there is a limit to the gains which Employee A can make. Thus, Employee A's learning rate looks low, but this is only because Employee A was efficient from the start. The cost accounting department recapitulates Employee A's production records in the manner suggested in Mr. Wyer's article and the compilations look like this:

Quantity of production	Cumulative average unit labor hours
1	1.000
2	.950
4	.902
8	.858
16	.815
32	.774
64	.736
128	.699
256	.664
512	.631
1024	.600

It is easy to calculate that Employee A has a 5 per cent learning rate and that the cost department should use a 95 per cent learning curve.

On the other hand, Employee B is faced with an operation (on the same item) which is completely new. Although the operation is not beyond his powers, it is one which must be learned and, further, it is one which his teacher (the foreman) must learn also. As might be expected, the first items which are turned out take a long time but, as production continues, technique is improved and, as the operation is facilitated by various jigs, and fixtures, Employee B gains efficiency at a great rate. The data compiled by the cost department for Employee B looks like this:

Quantity of production	Cumulative average unit labor hours
1	10.000
2	6.000
4	3.600
8	2.160
16	1.300
32	.875
64	.465
128	.280
256	.167
512	.100
1024	.060

Employee B has a learning rate of 40 per cent, and his curve is 60 per cent.

Now let us assume that the cost department did not have separate costs for each employee, and only knew the total for the two combined. Further (as an illustration), assume that the cost department checked the cost of the first and second groups, combined the results of both employees, and projected a learning curve based on the figures it derived. We have:

	AVERAGE HOURS		
	Employee A	Employee B	Total
Quantity:			
1	1.00	10.00	11.00
2	.95	6.00	6.95
Gain	.05	4.00	4.05
% of 1			36.8%

The cost department would calculate a learning curve of 63.2 per cent (100—36.8) and, on this basis, it would anticipate the average unit cost of the tenth group (1024 items) to be $1.1222(11.\sqrt[10]{.632})$ whereas, in our example, it works out to .660; viz:

Employee A	.600
Employee B	.060
Total	.660

Thus, a projection on the combined basis would be off (on the tenth group) by almost 100%. An extreme example, but examples have to be extreme. However, without details, let's try a moderate example. Assume equal beginning costs for each employee, and learning curves of 90 per cent and 80 per cent. The combined learning curve would be 85 per cent. The 90 per cent employee would have a 34.8 per cent cost on the tenth group. The 80th employee would have a 10.6 per cent cost—average 22.7 per cent. The projected cost on the average of 85 per cent would be 19.6 per cent. The error 15.8 per cent (22.7-19.6) ÷ 19.6).

Mathematically, the logarithmic projection only applies to data which reflects change at a definite rate. It is not possible to combine heterogeneous data by ordinary means, although there are advanced mathematical techniques* which will yield fair approximations under certain conditions. My advice is to calculate a separate learning curve for each operation *and combine the results.* Short cuts will not work. However, the learning curve produces almost unbelievable accuracy when applied to the proper data.

RICHARD M. ROTHSCHILD,
Los Angeles Chapter

* One possibility is the Beta Function.

Notes On Current Reading

Books and Pamphlets

Industrial Accountant's Handbook

Wyman P. Fiske and John A. Beckett, Prentice-Hall, Inc., 70 Fifth Ave., New York 11, N. Y., 1954, 1072 pp., $12.50.

The twenty-five contributed sections of which this handbook is made up run from basic concepts of industrial accounting to budgeting and budgetary control. All of the intervening sections are likewise pertinent to the interests of N.A.C.A. members and include organization for industrial accounting, building standards, control of operations and investment, cost reports and analysis of results, distribution and administrative cost analysis, and plant records and procedure.

Handbook of Accounting Methods—Second Edition

J. K. Lasser, D. Van Nostrand Company, Inc., 250 Fourth Ave., New York 3, N. Y., 1954, 1149 pp., $12.00.

The more than eighty separately-authored industry sections of this manual, now revised eleven years after initial issuance as the vanguard of a series of manuals edited by the late Mr. Lasser and treating accounting-related subjects, are preceded by text (as in the first editon) on the purposes of accounting systems, the reports which result from their operation, and the principles of system design. This handbook is associated by prefatory comment with those on auditing, cost accounting and tax accounting methods.

Industrial Engineering

Anglo-American Council on Productivity, Paper bound, 1954, 115 pp.

Continuing the work conducted by the Anglo-American Council on Productivity (the report of which on "Management Accounting in the U.S.A." received considerable interest here) is being continued by the British Council on Productivity and the present publication is a result of it, reporting this time in the realm of industrial engineering and giving the findings of a British Specialist Team in respect of American practice. Material covering job evaluation and incentives may be among portions of interest to the industrial accountant.

Articles

The Semantics of Accounting

R. W. Pinger, The Accounting Review, October 1954.

The author of this paper, out of his experience in teaching "engineering economy" to technical students, reports the conclusion that accounting language is disturbingly unstandardized by comparison with that of engineering or science. Examples are taken from the balance sheets of various companies showing the different uses of "equities," "net worth" and "profit and loss statement."

The Semantics of Inventory Costing

William E. Katon, The Federal Accountant, September, 1954.

The author is of the opinion that for an item of inventory the individual units of which are substantially identical, there is only one logical method to fairly present the cost—both for the residual in the balance sheet and the consumption in the operating statement. That method is "average." He feels particularly that any concept of costing which disregards the cu-

SELECTED ARTICLES FROM ACCOUNTING PERIODICALS

THE ACCOUNTING REVIEW, October 1954 (College of Commerce and Administration, c/o Carson Cox, Ohio State University, Columbus 10, Ohio, single copy $1.50)

The Entity Concept in Accounting, George R. Husband

Auditing with Accent on the Income Statement, Eduardo C. Gopez

Some Aspects of Public Utility Accounting, Harold G. Avery

Problems in Experimenting with the Application of Statistical Techniques in Auditing. John Neter

The Objectives and Material Contents of Elementary Accounting Courses for Majors in Fields other than Accounting, Catherine E. Miles

Opportunities for a Career in Governmental Accounting. D. M. Beights

*Depreciation on a Current Basis. George H. Warner

Some Aspects of the Evolution of Accounting Functions. V. E. Odmark

*Accounting and the Price Level. D. A. Ferguson

Uni-fied Accounting, William L. Raby

*The Semantics of Accounting, R. W. Pinger

New Developments and Simplified Approaches to Municipal Accounting, W. K. Newton

Accounting Research, John A. White

THE ARTHUR YOUNG JOURNAL, October 1954 (Arthur Young & Co., 165 Broadway, New York, N. Y.)

A New Look at Historical Costs vs. Current Costs, Thomas G. Higgins

Planning for Physical Inventories, Harold H. Hensold, Jr.

AUSTRALIAN ACCOUNTANT, August 1954 (430 Bourke Street, Melbourne, Australia)

Stabilized Accounting—Is it a Solution to Price Level Problems, Victor L. Gole

FEDERAL ACCOUNTANT, September 1954 (P.O. Box 53, Washington 4, D. C.)

Federal Government Accounting Principles, Howard W. Bordner

*A Practical Approach to Inventory Pricing, Charles A. Phillips

Requisites for Effective Inventory Control and Related Property Accounting, Edwin J. B. Lewis

*Semantics of Inventory Costing, William E. Katon

THE CONTROLLER, October 1954 (1 East 42nd Street, New York 17, N. Y., single copy $.50)

Economic Forecasting, Charles F. Roos

Price Redetermination in Defense Contracts, Paul M. Trueger

THE COST ACCOUNTANT, September 1954 (63 Portland Place, London W. 1, England)

The Contribution of Marginal Costing to Present-Day Problems, W. E. Harrison

RETAIL CONTROL, October 1954 (100 West 31st Street, New York 1, N. Y., single copy $.75)

Controlling Insurance Coverages and Costs, William E. Sharpe

The Control of Clerical Costs, T. M. Cox, Jr.

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* Further mentioned in accompanying notes on particular articles.

mulative effect of time is arbitrary and misleading.

A Practical Approach to Inventory Pricing

Charles A. Phillips, The Federal Accountant, September 1954.

The author believes that an accountant who attaches himself to a single principle or method of inventory pricing denying the logic or applicability of all other methods, will not be serving his employer as well as he who determines the management objectives to be served and then applies the accounting principles or method that will best achieve these objectives. He points out that the survey of corporate annual reports by the Research Department of the American Institute of Accountants mentions thirteen methods of cost determination for pricing inventories.

Accounting and the Price Level

D. A. Ferguson, Accounting Review, October 1954.

Indicating that some form of "common dollar" accounting may be needed to provide recognition of the effects of price level changes, the present author suggests that, as to "future periods," the adverse effects of such changes on the reliability of financial statements be at least partly corrected, by "stabilization of the price level . . . through monetary and fiscal measures."

Depreciation on a Current Basis

George H. Warner, The Accounting Review, October 1954.

With regard to the problem of the adequacies and inadequacies of accepted accounting methods of determining income, a study is here reported on, made in order to determine the consequences of price level changes on one element of cost—depreciation—and, through it, their effect on net income. An effort has been made in the article to demonstrate how net income would have varied for a few representative firms if depreciation had been calculated on a current rather than a legal dollar basis.

For Your Information

TOWARD FORECASTING

Forecasting continues to be the slippery penny with which economists and businessmen deal, disclosing some confidence but more hesitance. A short, graph-illustrated article on the subject of forecasting economic conditions is presented in the September 25, 1954 issue of *Business Week* (330 West 42nd St., New York 36, N. Y., single copy 25¢), taking as a point of departure the ending of 1954 and consequent general concern with plans for 1955. The paper is entitled "For Forecasting; What You Need to Know" and presents its subject in terms of four indicators: business (capital goods), government and consumer spending, and manufacturing inventories. The charts given for these carry curves through the spring or summer (to date of latest figures) and brief textual notations as to situations revealed and the timing of next available figures. The reading matter of the article closes on cautions having to do with indeterminable effects of the Congressional elections (now past), called the "over-riding imponderable."

A comment dealing with consumer spending (the full article would need to be read for balance of considerations advanced) states that, "Despite unemployment, the virtual elimination of overtime, and shorter hours generally, consumer income — and spending — show relatively little change from a year ago. Where income has dropped, consumers generally have been willing to cut their savings to avoid taking in sail on expenditures."

AN INVITATION TO RESEARCH

Research is the magic word today. Certainly research is far from new. Before the turn of the century, it was known to undergird the pure sciences. However, with relationship to results in business, there was something else which stood in its place, at least up to 1930 (and probably later), a certain thing called inventiveness. This was relied on to advance American industry through American ingenuity but was, in no wise, related to company structure. In fact, there was a great gap, to the satisfaction of practical men who, with broad shoulders and a degree of master-mindedness, took it on themselves to decide intuitively when and to what extent to tolerate or patronize inventiveness.

The gap is pretty narrow now. Practicality and research are close acquaintances. Research needs latitude but it is now programmed to yield results tied to industrial and company advancement. Contact between management and research is on a level of full mutual respect. Moreover, research has established itself beyond the sciences and products and processes to every activitity of business (and other activities beyond attention here). Every methodology has its research and that research is systematically relied on for progress.

Since World War II, accounting has been no exception to this. The principal associations in the field have set up their research departments and programs. In Section 2 of the October issue of the *Bulletin* and again in Section 2 of this issue there appears information as to what N.A.C.A. has been and is doing in this field, and Section 3 of the November issue, consisting of the Association's annual report, summarizes the accomplishments of the year 1953-1954.

One of the principal difficulties in conducting research is to locate the problems in a particular field which most need attention. There are a number of methods of attempting to solve this difficulty. One such, which may be of interest, relates to

the research endeavors of the American Accounting Association (principally composed of teachers of accounting). In the *Accounting Review* for October 1954 (College of Commerce, Ohio State University, Columbus 10, Ohio, single copy $1.50), there appears mention of twenty-five topics in an article by John A. White, the A.A.A.'s Research Director. Fifteen of these topics are set forth according to a scheme abstracted in the attached illustrative table, which identifies the subject matter but does not reproduce exposition of the proposed project or even its full caption. These elaborations are offered by Mr. White as significant, inasmuch as the proposed topics were contributed by individuals who had thought them out and are offered to students and others who might wish to undertake them. Each classification seems, as it were, an open-end list (it will be noted that there is only one item under each of several of the classifications), suitable for any degree of extension.

This means of stimulating research in accounting is new in the American Accounting Association's program and may hold general interest for that reason.

SUBJECT MATTERS OF ACCOUNTING RESEARCH SUGGESTIONS SET FORTH IN *ACCOUNTING REVIEW*, OCTOBER 1954, PAGES 661-670

THEORY	REPORTS	PUBLIC ACCOUNTING	INDUSTRIAL ACCOUNTING	TAXATION	REGULATION	EDUCATION
Principles	Sales deductions	Comparison with other professions	Scrap	Spin-off	In public utilities	Electronics
Disclosure			Service depts.		As public policy	
"Fortunate purchases"		In foreign countries			Certifications abroad	
Deferred compensation	The above captions and topics are much abbreviated from the exposition referred to, which identifies problems, approaches, etc. They are thus necessarily incompletely stated.					
Amortization of intangibles	The presentation also included briefer mention of ten other possible accounting research topics.					

PRIMER ON ELECTRONIC EQUIPMENT

In the course of understanding a difficult subject, we have to keep going back to our starting point if our introduction to the information is either inaccurate or complex—or, perhaps, with no aspersion on ourselves, if it is both accurate and simple. Certainly, many are finding this true of electronic office equipment. Consequently, it is helpful to have and review a writeup like "Light on the Future" an IBM pamphlet issued in 1953 and received in a recent mailing, which talks slowly and briefly about the successive topics of "Two Families of Computers" (analogue and digital), "Organization of Digital Computers," "New Developments," and "What's Next?"—and then supplies a short glossary of technical terms. The text on digital computer organizations—input, storage, arithmetic, control and outout—may already have a certain familiar ring but comes under the head of you-can't-say-it-too-often-because-we're-learning, and is interestingly diagrammed. The same is true of the "new developments" section which discusses magnetic tape, the magnetic drum, and electrostatic storage. In presenting "what next," the pamphlet

distinguishes the problems for which scientists and businessmen, respectively, need machines and points out that the computation side is more important to the scientists and the "data processing" side to businessmen, a side which requires much development beyond its present stage. The glossary, which lists thirty or forty terms, includes such pertinent ones as "access time," "erase," "input," "instruction," "read in," "read out," "serial operation," and "stored program."

There is also a little material useful in prying minds free from life-time ruts. Chief in this is description of the binary number series utilized in electronic equipment (translated by the machines at input and output to the decimal system). Binary numbers can state all quantities in just two symbols, 1 and 0. The value of one is doubled each time it is moved a space to the left, instead of being multiplied by 10 through this step, as in the decimal system which requires 10 symbols. Binary 1111 is, thus, 15 in the decimal system. Apparently the machines do not mind numbers which would write yards long from left to right.

ACCEPTED AUDITING STANDARDS: GENERAL, FIELD, AND REPORTING

At this time of year, it is possible that the standards which form accepted professional guidance for independent public accountants and their staffs are of slightly more than academic interest to accounting staffs of corporations. Interim work on the company's audit may be under way and the concluding work, with its complementary task of co-operation on the part of the company, is not far off for calendar year enterprises. Accordingly, there is a certain amount of interest among industry in *Generally Accepted Auditing Standards, Their Significance and Scope,* recently issued by the American Institute of Accountants (270 Madison Avenue, New York 16, New York).

This "special report" of the Institute's Committee on Auditing Procedures refers prefatorily to statements issued in other years, which run back through various publications to the 1917 *Federal Reserve Board Bulletin* (April 1917) which had its genesis in a memorandum prepared by the American Institute at the request of the Federal Trade Commission, the 1929 *Verification of Financial Statements,* the 1936 *Examination of Financial Statements by Independent Public Accountants* (modified in 1939), the subsequent series of topical statements by the Committee which were codified in 1951, and the 1947 issuance of the Committee's *Tentative Statement of Auditing Standards—Their Generally Accepted Significance and Scope.*

The text of the new statement covers general standards, standards of field work, and standards of reporting in its three principal sections. It runs to 54 pages in length and appears designed for reading as well as study.

It is not improbable that the portion of the text relating to field work may be nearly as pertinent to corporation accounting departments as the section on reporting standards is widely known to be. The field work section affords an understanding of auditing guides relating to materiality of matters under consideration, planning of field work and evaluation of "examinee's" existing internal control, as well as to "the competence of evidential matter."

NATIONAL ASSOCIATION OF COST ACCOUNTANTS
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